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ABSTRACT

This document describes the design, content, and methods of a teacher education program (TEP) with a specialization in environmental education (SEE), intended to prepare teachers for middle schools. The SEE is also suggested as inservice for staff members. Part 1 presents the goals of the TEP and translates these goals into learner objectives. It presents a model of environmental literacy and several crucial components of this model as they relate to the goals (e.g., environmental sensitivity and citizenship responsibility). Part 2 provides some background on the nature of the middle school and on characteristics of middle school teachers and students. Part 3 offers a full description of "core" courses, with specific suggestions for the inclusion of environmental content, and discusses concerns and suggestions regarding both the scope and sequence of courses within the SEE. Part 4, "Planning for Instruction in Environmental Education," focuses on the variables of instructional design, resources, and methods; presents the General Teaching Model as well as a set of corresponding instructional methods and resources; and discusses critical outcomes of instruction and the instructional strategies needed to help students realize those outcomes. Part 5 presents sample activities for courses within the SEE. (LL)

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30	An Environmental Education Approach to the Training of Middle Level Teachers: A Prototype Programme	E	1990

Unesco-UNEP International Environmental Education Programme

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An Environmental Education Approach to the Training of Middle Level Teachers: A Prototype Programme

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PREFACE

This document describes that portion of a Middle Level Teacher Education Programme (TEP) designed specifically to train middle level school teachers in environmental content and methods. This portion of the TEP serves as a Middle Level Specialization in Environmental Education (SEE), and, as laid out, consists of 48 credit hours of coursework. While this specialization serves as an ideal, its design and description are certainly open to revision in situations where time and resources will not permit full implementation. Knowing that some nations have two or three year teacher education programmes for the training of middle level school teachers, the authors recommend a careful articulation of content and methods courses which will, in fact, help train effective and responsible environmental educators.

The main focus of this document is on the design of a middle level specialization in the content and methods of environmental education. The reader is no doubt familiar with the tendency for middle level programmes to be organized along disciplinary lines, and for environmental education to be treated in an interdisciplinary manner. Despite any apparent disparity between these two programme orientations, the authors posit that it is both possible and necessary for a TEP/SEE to adequately prepare middle level school teachers in both disciplinary and interdisciplinary approaches to the design and delivery of environmental education. To effectively meet this requirement, it appears logical that the SEE should include both disciplinary and interdisciplinary coursework in the content and the methods of environmental education

Thus, the SEE laid out in this document contains two sets of courses: a "Core" set of courses which exclusively emphasize the content and methods of environmental education, and a set of more traditional disciplinary courses into which environmental content and methods have been "Infused" to a greater or lesser degree. The secret of the success of a specialization with these unique characteristics lies with the collegiate administrators and faculty members who are able and willing to support it; i.e., who are able and willing to see a complementary set of core and infusion courses offered. No document can mandate this kind of dedication and cooperation, hence these topics are covered only sparsely herein.

Even so, the tertiary (collegiate) staff members willing to offer a TEP specialization of this kind should consider the advisability of engaging in some form of inservice "teacher preparation" for those staff members that will offer coursework in the specialization. This would bring together administrators and faculty responsible for core and infusion courses, and quite possibly, develop the collegiality that will be necessary in making infusion work. Moreover, this kind of cooperation is needed if the staff members are to develop optimal complementarity between core and infusion courses.

This document is, hopefully, laid out in a manner that will prove meaningful and helpful to its readers. A number of foundational topics are included in Part I. First among these is the set of goals for the TEP Specialization in Environmental Education. Also included are discussions of the translation of these goals into learner objectives, of a model of environmental literacy, and of several crucial components of this model as they relate to the goals (e.g., environmental sensitivity and citizenship responsibility).

Part II provides some background on and assumptions regarding the Middle Level TEP as a whole. Part III lays out the TEP Specialization in Environmental Education, providing a full description of "Core" courses, and an outline with clear suggestions for the

inclusion of environmental content and/or methods in "Infusion" courses. In addition, concerns and suggestions regarding both the scope and the sequence of courses within the SEE will be discussed.

Part IV, Planning for Instruction in Environmental Education, focuses upon the critical variables of instructional design, resources, and methods. It presents in some detail the effective General Teaching Model (GTM), as well as a set of corresponding instructional methods and resources which reflect the goals presented in Part I. Most importantly, it includes a discussion of critical outcomes of instruction and the instructional strategies for successfully helping students realize them. Part V has been developed in order to present, in some detail, example activities for courses within the SEE. Thus, the activities displayed in Part V have been designed to fit both the "Core" content and methods courses and the "Infusion" content and methods course which comprise this specialization.

An important addition to the Preface involves the writers' use of terminology associated with "middle level education". The writers of this document and a variety of authors consulted tend to use a number of different terms to describe the educational setting involved in teaching students, ages ten (10) to fifteen (15). Some refer to this educational enterprise as "the middle school". Others refer to the "middle level school" and still others, focusing primarily on the uppermost part, refer to the traditional "junior high school", grades seven through nine. Thus, readers should remain flexible in interpreting the set of terms used in this document given that the writers have been unable to maintain consistency.

Suggestions for improving the contents of this document in its future revision will be received with thanks at the Environmental Education Section; Division of Science, Technical and Environmental Education; Unesco; 7 Place de Fontenoy; Paris 7, France.

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PART I

GOALS AND ASSOCIATED TOPICS

"Competent teachers do not emerge by good luck.
They must acquire and practice the attributes of
competency and skill during their education."

S. Selim, 1977

Introduction

The purpose of this document is to provide guidelines for the development of a teacher training programme (TEP) for middle level teachers. When implemented as intended, these guidelines will, in fact, result in teachers who are sufficiently competent and skilled to offer instruction in environmental education that will clearly contribute to the development of environmentally literate students. The preparation of such teachers requires a number of important ingredients; the most basic of which is curriculum planning. It is incumbent on those responsible for planning the teacher training curriculum - the writers, as well as those in teacher training programmes - to have in place a set of goals on which to base their curriculum decisions. Consequently, the writers have chosen to organize the development of this document around a valid set of goals statements for EE which have consistently proven effective when working with teachers and with students.

The goals on which this document will be based are a modified version of the curriculum goals initially developed and published (1980) by Hungerford, Peyton, and Wilke. These goals were drafted from, and subsequently validated against the categories of objectives for environmental education (EE) accepted at the Tbilisi Conference (1978). The ultimate aim is paraphrased from the seminal work of Harvey (1977) on the substantive structure of EE. The goal levels should be viewed as hierarchical, and considered as such when used in a teacher education programme, or, as in this case, a specialization within such a programme. Courses within a TEP should be designed to help teachers comprehend and realize the goals at each level, and most importantly, to implement these goals in their own classrooms. Finally, it should be clear that specific learner objectives must be developed for instructional activities designed to facilitate teachers' comprehension, realization, and implementation of these goals - and of the aim of EE.

Goals for a Middle Level Preservice Specialization in Environmental Education

The Ultimate Aim

The ultimate aim of EE is to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated for working, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.

Goal Level I
The Ecological Foundations Level

Upon completion of a middle level teacher education programme specialization designed to develop an effective environmental educator, the inservice middle level teacher should be expected to be able to...

1. ... communicate and apply - in an educational setting - major ecological concepts including those which focus on individuals and species populations; communities and ecosystems; biogeochemical cycles; energy production, storage, transfer and degradation; interdependence; niche; adaptation; succession; homeostasis; and human as an ecological variable.

2. ... apply knowledge of ecological concepts to the analysis of environmental problems and issues, and be able to identify important ecological principles involved.

3. ... apply a knowledge of ecological concepts in predicting the probable ecological consequences of alternative solutions to environmental problems.

4. ... understand principles of ecology in order to identify, select and utilize appropriate sources of information in a continuing effort to investigate, evaluate and develop solutions for environmental problems.

Goal Level II
The Conceptual Awareness Level

5. ... understand and communicate how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from an ecological perspective.

6. ... understand and communicate how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

7. ... identify a wide variety of local, regional, national, international, and global environmental issues, as well as the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues, as well as the ecological and cultural implications of these various solutions.

9. ... understand and communicate the need for environmental issues investigation and evaluation as prerequisites for sound decision making.

10.... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

11.... understand and communicate the need for responsible citizenship action in the solution of environmental issues.

Goal Level III
The Investigation and Evaluation Level

12.... apply the knowledge and skills needed to identify and investigate environmental issues (using both primary and secondary sources of information), and to synthesize the data gathered.

13.... demonstrate the ability to analyze environmental issues, and the associated value perspectives for their ecological and cultural implications.

14.... demonstrate the ability to identify alternative solutions for important environmental issues, and the value perspectives associated with those issues.

15.... demonstrate the ability to evaluate alternative solutions and associated value perspectives for their ecological and cultural implications.

16.... demonstrate the ability to identify and clarify personal value positions related to important environmental issues and to their associated solutions.

17.... demonstrate the ability to evaluate, clarify, and modify personal value positions in light of new (additional) information.

Goal Level IV
The Environmental Action Skill Level

18.... demonstrate the ability to design action plans using citizenship action strategies associated with each of the following categories of strategies: consumer action, physical action (ecomanagement), persuasion, political action, and legal action.

19.... demonstrate the ability to evaluate specific (selected) action strategies in light of their ecological and cultural implications.

20.... demonstrate the ability to implement action plans and apply action skills for the purpose of resolving or helping to resolve one or more environmental issues.

Goal Level V
The Instructional Applications Level

21.... demonstrate the ability to both select and develop curricular/ instructional materials which address each of the four EE goal levels, and which are appropriate for use in middle level settings.

22.... demonstrate the ability to organize and implement instruction at each of the four EE goal levels using those teaching strategies which have proven effective, and which are appropriate for use in middle level settings.

23.... demonstrate the ability to design and carry out appropriate assessments of student learning at each of the four EE goal levels in middle level settings.

24.... demonstrate the ability and a willingness to modify one's selection of instructional materials and/or strategies based upon the results of classroom evaluations and assessments.

Topics Related to the Goals

Professionals using this document are not asked to accept the goals as stated in Part I without questioning their validity and their effectiveness. In addition, several other topics should be addressed to help professionals understand those goals in greater detail, and use them with greater assurance in their particular educational setting. The writers will begin with a discussion of validity considerations and follow with a discussion of these other important considerations.

Validation of the Goals

In an effort to assess the content validity of these goals, their developers sought to compare the goal statements at each of the first four goal levels with the five categories of environmental education objectives endorsed at the Tbilisi Conference. To make this comparison, the developers constructed a two-axis comparison grid. Using this grid, the developers independently analyzed each goal, identifying where an interface existed with the Tbilisi objective statements. Following this individual assessment, the developers met together to synthesize the results of their individual analyses. They discovered that the goals bore a marked correspondence to the Tbilisi objectives (Hungerford, Peyton, & Wilke, 1980). Observing this agreement, the developers inferred a substantial degree of content validity for the goals as originally written.

Subsequent to the developers' initial content validity assessment, they submitted the goals to a validity panel consisting of seven professionally recognized environmental educators in the U.S. Validity panelists were asked to respond to a series of questions which would lead them to rigorously inspect the goals and their validity. Completed validity assessments were received from five of the seven panelists. In general, the comments received from the panel were consistent. The goals were revised in accordance with the panelists' comments and were thereafter considered valid.

The goals were published in 1980 along with a detailed statement of the assumptions made by the developers. The stage was set for the goals to be used in a variety of ways by professional environmental educators and curriculum developers at all educational levels. The writers of this document are aware that the goals have been widely used in the field, with the results further establishing their validity. A brief description of several of these uses follows.

Since their development, a major use of these goals has been in the area of research. Numerous studies have utilized the goal levels as an organizational framework, or have directly investigated learning outcomes directly related to one or more of the goal levels. Among those studies using the goals as an organizational framework are those by Gardella (1987), Stevenson (1986), and Volk, et al. (1984). Each used the goals to look at a particular aspect of EE curricula. Gardella's work focused on the development of an instrument in which the goals were among the criteria employed in assessing EE curricular materials. Stevenson employed the goals in an analysis of curricular materials widely used in Australia and the U.S. In a national assessment of curricular needs in the U.S., Volk, et al. sought responses of professionals from two environmental education organizations to several curriculum questions pertaining directly to the goals (e.g., "To what extent do existing curricula accomplish this goal?").

Although these three studies were quite different in their purpose and design, the researchers arrived at conclusions which were quite similar. In general, they found that content and activities associated with the lower goal levels (i.e., ecological foundations and

awareness of issues) were much more prevalent in curricular materials and in practice than those which addressed the higher goals (i.e., issues investigation/evaluation and citizen action). Interestingly, these findings are highly consistent with those reported by Childress (1978) in his national assessment of EE curricula used in U.S. schools.

In addition, the study by Volk, et al. (1984), and a study by Champeau et al. (1980) both used the goals as a framework for assessing perceived needs for EE curricular materials in the U.S. Despite the fact that Volk et al. used a sample of EE professionals, and Champeau et al. used a sample of K-12 teachers, both sets of results indicate agreement on the need for additional curricular materials at each goal level.

Several studies which made use of the goals focused in whole or in part upon teacher preparation variables. While Volk, et al. (1984) and Champeau, et al. (1980) both included questions pertaining to the need for teacher preparation in their studies, Peyton and Hungerford (1980) focused their entire studies on these questions. Peyton and Hungerford chose to focus their study on the fourth goal level (i.e., citizen action), and investigated the abilities of preservice and inservice teachers to identify, teach, and implement environmental action skills.

Again, while these studies reflect differing purposes and methods, their findings are quite consistent. In response to the Volk, et al. and Champeau et al. question about need, both samples clearly indicated a strong need for additional teacher preparation. The results in the Peyton and Hungerford study indicated that their samples of teachers perceived that they had limited environmental action skills, and very few reported active involvement in environmental action. In general, these teachers felt that they could teach from, but not prepare materials for use at this goal level. These findings are highly consistent with the general teacher needs identified by UNESCO (1977b), and with the specific training needs at higher goal levels more recently identified by Wilson (1988).

From this discussion one might, but need not, conclude that all studies utilizing the goals have focused on questions relating to needs and problems in EE. There are several experimental-type studies which have looked into what happens when teachers who are prepared to teach for the goals use materials and teaching strategies designed around one or more of the goals with their students. Interestingly, most of these studies have been conducted using middle level level student samples.

Volk and Hungerford (1981) investigated the effects of instruction at goal levels two and three (i.e., issue awareness and investigation/ evaluation) using seventh grade students. They found that students exposed to such instruction were far better prepared to identify and describe key aspects of environmental issues than students exposed to awareness-oriented instruction. Ramsey, et al. (1981) and Klingler (1980) also implemented an EE program based upon the goals, and attempted to ascertain whether such goal-oriented instruction did, in fact, elicit responsible environmental behavior among eighth graders. The results of both studies strongly suggest that middle level aged students who were allowed to develop and apply the knowledge and skills reflected in the first four goal levels not only acquired such knowledge and skills, but also initiated and participated in responsible environmental behaviors to a greater degree than students who had experienced only awareness-oriented instruction.

Results from more recent studies by Ramsey (1987) and Holt (1988) further confirm that instruction aimed at the higher goal levels (i.e., issue investigation/ evaluation and citizen action) are largely responsible for these effects among middle level students. Finally, Jordan, et al.'s findings indicate that these results also hold for slightly older high school students (1986). Collectively, these studies provide clear and convincing evidence

that teachers prepared to teach for the full range of goals presented in this document can and do make an educationally significant difference with their students!

Translating the Goals into Learner Objectives

The goals, as stated, are simply a framework to be used in making curricular and instructional decisions in EE. However, in their present form, the goals are stated in such general terms that they can hardly be used as a guide for preparing instruction. On the other hand, the goals do serve as an important set of guidelines for identifying what are desirable learning outcomes in EE. Thus, there is a recognizable need for an intermediate step between stating goals and preparing for instruction. In this intermediate step, the intentions of the goals are translated into more specific statements of desirable learning outcomes traditionally referred to as learner objectives. Learner objectives are sometimes referred to as performance objectives, for in many cases they clearly identify what students should be able to do after exposure to a segment of instruction. In any case, these objectives are stated in such a way as to focus upon what the learner, rather than what the teacher will do.

If we see certain kinds of learning outcomes in EE as desirable, then it only makes sense that we state them as clearly as possible, and then proceed to use them as we preparing for and engage in instruction. Regardless of the particular term used for the objectives being prepared, it is important that each objective clearly state what the student should learn, and how that learning should be displayed or observed. On this point, a noted American educator has argued persuasively that each objective should clearly include the "content" (i.e., the facts and ideas, skills, and dispositions) that we want students to learn, as well as what we want students to do with that content (Tyler, 1949). Tyler referred to the latter as "operations", indicating that, as educators, it our responsibility for doing more than simply asking students to take in facts, ideas, skills, and so on. If students are to learn these, they must be actively engaged in learning them (i.e., operating on them). Interested readers are referred to taxonomies of objectives which may be helpful in drafting objectives around a variety of cognitive operations (Bloom, et al., 1956) and affective operations (Krathwohl, et al., 1956). However, despite their prominence, these two taxonomies should not used as the only sets of operations when drafting objectives of importance to this document or to EE.

Probably the most important, and the most confusing objectives are those which emphasize the development of skills (e.g., science process skills, skills used in investigating and analyzing environmental issues). Skills are often considered confusing because educators disagree as to whether they should, as Tyler suggests, be treated as contents or as operations. The truth of the matter is they may be either, and probably need to be both. For example, almost any skill which is deemed to be desirable for students to learn may be seen initially as a content (e.g., "... define and identify examples of prediction"). Later, as students demonstrate their familiarity with this skill, it may be included in objectives as an operation (e.g., "... predict what will happen when an acid and a base are mixed"). This dual use of skills in the preparation of objectives will be apparent throughout this document.

In a previous paragraph, it was suggested that objectives, once they are identified and clearly stated, can be used for translating goals into reality in the classroom. How does one use the learner objectives one has prepared? First, objectives which clearly state their contents and operations will often imply the kind of activities students should engage in. Thus, objectives serve as an important guide in selecting and/or developing activities for students. In this vein, they also serve as the basis for organizing instruction around those

activities. Second, a clear set of objectives may be presented to students at the outset of instruction, or even prior to evaluation (e.g., a test) so that students know what will be expected of them. Third, clearly written objectives may be effectively used as the basis for developing evaluation measures. If, as suggested, objectives clearly state what the student should learn and how that learning should be displayed or observed, then objectives also suggest what students should be evaluated on (i.e., what they learn) and how they should be evaluated (i.e., how that learning should be displayed). Evaluation based upon learner objectives allows the teacher to compare desirable learning outcomes with what students actually learned (i.e., actual learning outcomes).

Since this document is not intended to serve as a text on curriculum development or on the preparation of learner objectives, these comments must suffice. Interested readers are referred to other Unesco documents which treat the topics in greater detail (e.g., Hungerford & Peyton, 1986). Still, the reader may appreciate examples of learner objectives derived from the goals presented here. It is recognized that several examples of learner objectives might help clarify earlier points on the drafting or use of objectives. Further, examples might aid readers in conceptualizing how the goals can be infused into content and methods courses within a Teacher Education Programme. What follows, then, is an effort to display sample learner objectives derived from the EE goals (Hungerford, Ramsey, & Volk, 1989; Hungerford, Volk, et al., 1988). The reader can infer where such objectives would best fit into a collegiate programme specialization designed to train middle level teachers in the contents and methods of EE.

Sample Learner Objectives by Goal Level

Goal Level I. The Ecological Foundations Level

Goal Statement No. 1: ... communicate and apply - in an educational setting - major ecological concepts including those which focus on individuals and species populations; communities and ecosystems; biogeochemical cycles; energy production, storage, transfer and degradation; interdependence; niche; adaptation; succession; homeostasis; and man as an ecological variable.

Upon completion of instruction, the learner should be able to ...

1. ... compute population density for a given species using the formula D = N/S.

2. ... explain why a species population can be considered as a specific level of organization in the biosphere.

3. ... communicate the major conceptual differences between an ecological community and an ecosystem.

4. ... identify a minimum of five abiotic variables which may affect a given ecosystem. For each, be able to explain how that variable impacts on the character or development of that ecosystem.

5. ... explain the relationship between a species' tolerance range and limiting factors in an ecosystem.

6. ... observe a discrete ecosystem and describe (using diagrams) at least two ways in which energy flows through that system.

7. ... explain why organisms are involved in competition within an ecosystem, and provided valid examples. Also, distinguish between and provide valid examples of intraspecific competition and interspecific competition.

8. ... explain why an organism with a specialized niche may be very susceptible to changes in the ecosystem.

9. ... conduct a field investigation of two separate and distinctly different forest areas, and determine the successional stage of each.

10. .. define homeostasis, and explain how this concept might apply to a particular ecosystem in the region. Further, identify three discrete examples of how human activity in that ecosystem could affect (or have affected) this.

Goal Level II. The Conceptual Awareness Level

Goal Statement No. 10: ... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

Upon completion of instruction, the learner should be able to ...

1. ... read two news articles on the same issue, and from them, identify at least two parties which take differing positions on that issue.

2. ... given a particular organization's position (or posture) on an environmental issue, identify the rationales and beliefs that organization uses to defend its position.

3. ... given a set of differing positions on a given issue, identify a minimum of two differing values which underlie these positions.

4. ... locate two separate issue-oriented information sources, and compare/contrast the beliefs and values expressed in each.

5. ... describe how differing governments' (or within one government, differing branches') beliefs and values appear to have influenced the development of a particular issue (e.g., acid rain in North America or Europe, harvesting of whales, desertification in Africa, destruction of tropical rain forests, marine fisheries management).

Goal Level III. The Investigation and Evaluation Level

Goal Statement No. 12: .... apply the knowledge and skills needed to identify and investigate environmental issues (using both primary and secondary sources of information), and to synthesize the data gathered.

Upon completion of instruction, the learner should be able to ...

1. ... identify examples of environmental issues which lend themselves to information gathering using: a) surveys, b) questionnaires, and c) opinionnaires.

2. ... after identifying an issue of local or regional concern, develop a list of what is known and not known about that issue. Using these lists, prepare a list of information that needs to be collected during an investigation of that issue.

3. ... in planning for a research study involving the use of either a questionnaire or an opinionnaire, identify at least three discrete sample populations to whom this instrument could administered (e.g., in a study on local solid waste practices: householders, waste haulers, landfill managers, local government officials, environmental scientists or ecologists).

4. ... demonstrate the ability to write to a governmental or private agency seeking specific information about an environmental issue.

5. ... after locating an article on a current environmental issue, prepare a written summary which accurately communicates the main points of that article.

6. ... after identifying the major points from each in a series of articles on a select issue, prepare a written summary which organizes these points and clearly identifies any discrepancies (real or apparent) among them.

7. ... given a research question and a set of data collected on that question, formulate and defend in writing logical conclusions, inferences, and recommendations based on those data.

Goal Level IV. The Environmental Action Skill Level

Goal Statement No. 18: ... demonstrate the ability to design action plans using citizenship action strategies associated with each of the following categories of strategies: consumer action, political action, physical action (eco-management), persuasion, and legal action.

Upon completion of instruction, the learner should be able to ...

1. ... identify at least three action strategies could be classified as examples of political action.

2. ... describe the dangers of persuasive actions based only upon emotional appeals.

3. ... identify at least three environmental problems or issues in your region which could be resolved using ecomanagement (physical) type action.

4. ... explain why actions taken by groups tend to be more effective than actions taken by a single individual.

5. ... for an action strategy which has been suggested as a means of resolving a particular environmental issue, develop an initial outline of the steps required to effectively implement that action strategy.

6. ... explain why the resolution of environmental issues will often require the combined use of two or more categories of action strategies.

7. ... given an initial action plan, identify (by type) all resources required to effectively carry out that plan.

8. ... identify all specific tasks required to carry out a particular action, and organize those tasks into a timetable for carrying it out.

Goal Level V. The Instructional Applications Level

Goal Statement No. 22: .... demonstrate the ability to organize and implement instruction at each of the four EE goal levels using those teaching strategies which have proven effective, and which are appropriate for use in middle level settings.

Upon completion of instruction, the learner should be able to ...

1. ... develop a set of activities designed to provide students with an opportunity to develop a well thought out plan of action for resolving an environmental issue of local importance.

2. ... design a lesson around activities which could be used to teach students about the nature and uses of surveys, questionnaires, and opinionnaires.

3. ... sequence a series of proposed lessons (or activities) to be used in teaching a unit on ecology on the basis of the logical development of the ecological concepts to be taught.

4. ... identify three separate and distinct teaching strategies which have proven effective in teaching at "The Investigation and Evaluation Level", and defend your selection on the basis of either research findings or teaching experience.

5. ... teach a lesson which: a) provides students with opportunities to clarify the value positions they take on a set of controversial environmental issues of local (or regional) importance; b) reflects the teacher's sensitivity toward students and their comments; and c) which encourages students to be sensitive toward other students and their comments.

6. ... organize and teach a series of lessons designed to help students develop the ability to weigh the ecological and cultural implications of a set of environmental issues of national significance.

[Note: Additional learner objectives have been included in Part III]

Relationship Between the Goals and Environmental Literacy

The first challenge in K-12 EE is to arrive at the decision to design curricular and instructional programmes such that they clearly contribute to the development of an environmentally literate citizenry (Hungerford & Volk, 1984). The term "environmentally literate citizenry" has been in use since the earliest days of environmental education (e.g., Stapp, et al., 1969). Its use is either apparent in or is strongly implied in nearly every statement of the mission, aims, goals and objectives of EE which have been offered since that time (e.g., Stapp & Cox, no date; Harvey, 1976; Trends in Environmental Education, 1977). Such statements have perennially focused upon the set of variables which professionals in the field thought would characterize environmentally literate citizens (e.g., Roth, 1971), or more recently, which would constitute a model of environmental literacy (e.g., Hungerford & Tomera, 1985).

The model offered by Hungerford and Tomera is considered by many to be the results of an attempt to synthesize conceptual development within the field and the growing body of research findings pertaining to EE (e.g., Iozzi, 1984; Sia, et al., 1985/86; Hines,

et al., 1986/87; Marcinkowski, 1988; Sivek, 1988). Due to the consistency of the research findings associated with the variables in this model, it will serve as the basic model underlying this document. At the same time, this model is open to refinement as research findings shed new and important insights into the nature and development of environmental literacy.

Once the decision has been made to orient a programme toward the development of environmentally literate citizens (or students), the next challenge one faces is to operationalize the literacy model one accepts (Hungerford & Volk, 1984). How one goes about that depends, in part, upon the kind of model one accepts. For example, having decided to accept the model posited by Hungerford and Tomera (1985), one would need to translate the variables they have identified into statements of educational goals. In this case, the developers included variables emphasizing knowledge of ecological concepts, of environmental issues, and of citizen action. These variables are clearly emphasized in the first four goal levels presented earlier in this section. In addition, the variables emphasizing environmentally-related beliefs, attitudes, and values have also been emphasized within the goal statements and sample objectives within the issue awareness and issue investigation/evaluation goal levels. The clear relationships between the Hungerford and Tomera model of environmental literacy and the goal structure adopted for use in this document depicted in Table 1 are no accident. They are the result of careful thought, study and planning.

As implied in Table 1, one must carefully consider whether all components of a model of environmental literacy can be translated into goal statements. Again, in reference to the Hungerford and Tomera model, it would seem that environmental sensitivity and locus of control cannot be. Hence, it becomes necessary to see that these variables are accounted for elsewhere within the curriculum and instructional development process. The next sections present discussion designed to help interested readers further understand these (and several other) variables, as well as how they might be accounted for within educational programmes.

A Chart Depicting the Relationships between the Model of Environmental Literacy and the EE Goal Structure Adopted for Use in This Document

Literacy Model Variable	Goal Levels Whose Goal Statements Address these Variables
Environmental Sensitivity	None
Ecological Concepts	Level I: Ecological Foundations
Knowledge of Issues	Level II: Conceptual Awareness and Level III: Investigation and Evaluation
Beliefs, Attitudes and Values	Level II: Conceptual Awareness and Level III: Investigation and Evaluation
Locus of Control	None
Citizen Action	Level IV: Environmental Action Skills

Environmental Sensitivity - A Foundational Variable

It should be noted that in addition to the EE goal levels used in this document, another goal was stated or at least strongly implied in the Tbilisi Objectives. That is the goal of environmental sensitivity. More appropriately, as the developers of the "Goals for Curriculum Development in Environmental Education" have suggested, environmental sensitivity can be viewed as a pre-goal, or a foundational goal, to the previously described goal levels.

Environmental sensitivity might be defined as "a set of affective characteristics which result in an individual viewing the environment from an empathetic perspective" (Peterson, 1982). Individuals who are sensitive to the environment possess a basic appreciation and concern for the natural environment. Unto themselves, they are rarely of sufficient intensity to motivate an individual to act on behalf of the environment. More commonly, they can and do motivate individuals to learn more about the natural environment (ecology) and about a variety of environmental problems/issues. This is why it is referred to as a foundational goal.

The research into environmental sensitivity is of relatively recent origin, primarily because has been so difficult to measure. In the early 1980's, Tanner (1980) and Peterson (1982) developed a method of measuring sensitivity which involved the identification of individuals' past experiences which appeared to regularly contribute to the formation of these affective characteristics. Additional use of this method (e.g., Scholl, 1983) and additional research evidence (Marcinkowski, 1988) strongly suggests its validity. Further, a more recent body of research suggests that environmental sensitivity is a significant and major predictor of environmentally responsible behavior (Sia, et al., 1985/86; Hines, et al., 1986/87; Marcinkowski, 1988; Sivek, 1988). As such, environmental sensitivity appears to be an important experiential and motivational precursor for the sustained development of environmentally literate individuals. If there is merit to these conclusions, then the development of environmental sensitivity is most certainly pertinent to this discussion.

What are the experiential or developmental variables which Tanner (1980), Peterson (1982), Scholl, (1983), and Marcinkowski (1988) have identified as affecting environmental sensitivity among (adult) conservationists and environmental educators? The results of these studies tend to be fairly uniform in their response to this question. Apparently, there are experiential, affective and cognitive aspects to the development of sensitivity. While sensitivity is itself an affective variable, its development appears to result from an interplay of outdoor experiences, favorable human interactions, and knowledge about the natural environment. Peterson's sample of professional environmental educators reported an interest in the outdoors and natural systems which contributed to an initial environmental sensitivity at an early age ($x = 12.25$ years). Enriched by frequent experiences in natural settings and open spaces, this sensitivity continued to grow and strengthen through the years. This sensitivity was further reinforced by an increasing knowledge about natural systems, and was nurtured through both direct (i.e., familial and non-familial) and indirect (e.g., authors) role models. These role models were themselves empathetic toward the environment, and usually actively involved in a variety of environmental activities and interests. These findings suggest that there are several dimensions of environmental sensitivity which hold important implications for the types of educational experiences provided for teachers, and in turn, for their students. The remaining paragraphs in this section will focus directly upon this.

The formative outdoor experiences described by Peterson's sample included activities such as exploring and playing as a child, hunting and fishing, and involvement in outdoor-oriented youth organizations or in group camping. Moreover, these experiences

often occurred in solitary, small group, or family settings. Formal pre-college education would be hard pressed to include within its curricula these kinds of activities described by Peterson's sample. For this reason, it is also difficult to draft realistic goal statements for these facets of environmental sensitivity, even though these kinds of experiences should be encouraged by and in school programmes.

On the other hand, formal pre-college education can include two other salient factors affecting the development of environmental sensitivity. Those two factors, role models and environmental knowledge, are often closely related. Peterson suggested that "educator role models appear to be as important as outdoor experiences in developing [environmental sensitivity]" and that EE programs should "provide exposure to environmentally concerned and active individuals." In her study, she found that teachers constituted the majority of the role models named, stimulating interest in natural systems as well as providing educational and professional guidance.

The question pertinent to this document, then is how to prepare such a teacher. Research strongly suggests the merit of youthful outdoor experiences. As noted above, the average age pinpointed for the initiation of environmental sensitivity was 12.25 years. Teacher education institutions cannot guarantee (or require) that individuals entering their programmes have had access to such youthful outdoor experiences. These institutions can provide preservice teachers with experiences in natural settings through course-related field work, as well as through informal organizations. Every effort must also be made to provide interesting and informative coursework about ecology and natural settings, and to provide effective role models by way of professors who are actively involved in environmental concerns. While attending to the development of environmentally sensitivity in preservice by these means, the teacher education programme must also ensure that the teachers it produces have the capability to serve, in turn, as facilitators of environmental sensitivity in their students. Thus, early programme activities designed to foster the development of sensitivity, must, later in the program, give way to discussions on the nature of and methods for encouraging the development of sensitivity in their prospective students.

Helping Learners Develop an Internal Locus of Control

Unlike environmental sensitivity, locus of control cannot be considered as an education goal in even a pre-foundational sense. However, like sensitivity, it does appear to be comprised of experiential, affective and cognitive factors. It also appears to develop over time, and its development corresponds to more than one goal level. Lastly, it too appears to hold implications for the overall development of environmental literacy.

Locus of control can be defined in several ways. In its broadest sense, it refers to an individual's sense that he or she can manifest some degree of control over desired outcomes of a specific activity. The literature on social learning theory, expectancy theory, and efficacy perception have all contributed to the development of and definition of this psychological construct (Rotter, 1966; Rotter, Chance, & Phares, 1972; Phares, 1976; Lefcourt, 1981, 1982; Rotter, 1982; Hines, et al., 1986/87). Over time, the results of research on locus of control have been used to modify and refine this definition. In earlier research, the emphasis was on distinguishing between an internal locus vs. an external locus of control. Here "internal" referred to the belief that they themselves exerted control, while "external" referred to the belief that outcomes were controlled by external forces (e.g., Rotter, 1966; Levenson, 1972, 1974). Research eventually refined this view, leading to a distinction between those who believed external forces to be "powerful others", and those who believed external forces like "chance" (or luck) controlled events (Reid &

Ware, 1974). Still other researchers have attempted to further distinguish between the belief that outcomes were determined by "fate" as opposed to by "chance". Through these efforts, it became apparent that individuals held very different views about why things happened the way they did, thereby leading individuals to respond to the same set of circumstances in very different ways.

The research into the role of locus of control in environmental matters is somewhat older and more established than is research for environmental sensitivity (Peyton & Miller, 1980). Recent reviews indicate that there are at least thirty studies into the role of locus of control or efficacy perception in EE (Hines, et al., 1986/87; Marcinkowski, 1988). Three particular points about these studies are germane to this discussion. First, many of the EE-related studies in this area have been included in a quantitative synthesis. In general, this synthesis reveals a consistent and strong positive relationship between: (a) individuals' belief in an internal locus of control and their actual involvement in responsible environmental behavior ($r = .379$), and (b) their feeling of personal efficacy and this kind of involvement ($r = .355$). While the exact role of an internal locus of control in shaping responsible environmental behavior is not clear, that it does play an important role is very clear.

Second, following trends in the more general locus of control research, several studies in EE have found that an internal locus of control is, to some degree, situation specific (Lefcourt, Von Beyer, Ware, & Cox, 1979; Peyton & Miller, 1980; Champeau & Peyton, 1984; Tulman, 1983; Sandford, 1985). These findings suggest that while individuals may generally believe that they can influence over the outcomes of environmental issues, whether or not they believe they can do so for particular issues appears to depend upon specific issue-related circumstances (e.g., familiarity or previous experience, the presence of "powerful others"). Finally, in light of this, a few studies have looked at the extent to which a person's internal locus of control reflects their own individual abilities versus the sense that they are part of a larger group effort capable of wielding broader influence (e.g., Sia, et al., 1984/85; Culen, et al., 1986; Marcinkowski, 1988; Sivek, 1988). The results of these studies indicate that individuals tend to believe that a group can wield more influence than an individual, suggesting that many people subscribe to the widely held notion that there is power in numbers when confronting large and often complex environmental issues.

From these results, one may infer why locus of control has been included in Hungerford and Tomera's model of environmental literacy (1985), as well as why the writers of this document feel that it must be given due consideration in the design of educational programmes in EE. While few, if any, research studies have investigated how an internal locus of control may naturally develop, there are some preliminary indications as to how educational programmes may contribute to its development. Studies by Ramsey (1987) and Holt (1988) were designed to help middle level students develop the skills needed to investigate, evaluate, and then take action on environmental issues (i.e., the study treatments focused upon Goal Levels III and IV in this document). In the Ramsey study, seventh grade classes taught by three teachers (i.e., one each in Illinois, Missouri and Kentucky) trained in the goals, content, and methods of EE were compared to control classes. Basically, Holt did the same with her own class of average to low ability students. The results of both studies indicated that when students were able to develop these skills, their locus of control shifted in a positive, internal direction. In other words, students began to feel that they could have an impact on issues of interest and importance to them once they had developed the basic skills to do so. In contemporary terms, the students felt empowered.

However, this should not be interpreted as suggesting that these middle level students are ready to take on a large, complex issue. Once students possess these skills, it would seem prudent for teachers to encourage students to investigate easier-to-tackle issues where students have a high probability of making an impact. Only after experiencing success should students be encouraged to gradually move on to more difficult issues. Developing skills and experiencing success using them both appear to contribute to a sense of self-confidence. These three appear to be key factors which contribute to the development of an internal locus of control (Peyton, & Miller, 1980).

Once again, the question pertinent to this document is how to prepare teachers with respect to this. As with sensitivity, teacher education institutions cannot guarantee (or require) that individuals entering their programmes have developed an internal locus of control. However, like the teachers in the Ramsey study (1987), preservice teachers must be provided with training in those skills associated with issue investigation, issue evaluation and citizen action (i.e., Goal Levels III and IV). Once these skills have been developed, preservice teachers should also be provided with opportunities to apply those skills in as real-life a setting as is possible. During such projects, these teachers would certainly benefit from the careful guidance and support of their professors. And, while attending to the development of preservice teachers' skills and internal locus of control by these means, the teacher education programme must also ensure that the teachers it produces have the capability to help their students develop these skills and an internal locus of control. As before, programme activities designed to foster the development of a locus of control, must, later in the program, give way to discussions on the nature of and methods for encouraging the development of an internal locus of control in their prospective students.

Cultivating a Sense of Personal Responsibility and Commitment

Unlike environmental sensitivity and locus of control, personal responsibility for and verbal commitment to the solution of environmental issues have not been included as separate variables in Hungerford and Tomera's model of environmental literacy. However, this does not mean that there is no place for these variables in this model. As will be described below, both appear to be closely associated with the citizen action variable. Similarly, this absence should not be taken to mean that these variables are unimportant. On the contrary, research findings clearly suggest that they may be very important.

In general, personal responsibility and verbal commitment may be classified as "behavior intention" variables, since both responsibility and commitment are thought to serve as broad predispositions, or indications of one's willingness to engage in some form of behavior. In the EE-related literature, support for this classification is apparent, since EE measures of both variables include items which either state or strongly imply a willingness to engage in certain types of environmentally responsible behavior (Hines, et al., 1985/86; Marcinkowski, 1988). Beyond this, responsibility and commitment become difficult to define as separate and distinct variables due to the limited state of relevant theory and research. They are complex constructs which, like sensitivity, appear to be comprised of experiential, cognitive, and affective components.

Why, then, are these variables so important? There are two brief responses to this question. First, psychological theorists (e.g., Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1977) have suggested that, although limited, the best indicator of what a person will actually do is what they intend to do or say they will do. In this light, any variable which serves as an indicator of intention becomes useful in understanding and predicting behavior - in this case, responsible environmental behavior. Moreover, from an educational standpoint, such variables may serve as one criterion of the relative success of efforts to prepare

environmentally literate individuals (i.e., given the definitions of and goals for environmental literacy reviewed in this document). In cases where one cannot use the observance actual participation in responsible environmental behavior as the final criterion of success, then the communication of intention, (and by inference, of responsibility and commitment) may serve as sound criteria.

Secondly, in a quantitative synthesis of research findings on the relationship between various variables and responsible environmental behavior, Hines, et al. (1985/86) identified six studies which investigated the relationship of verbal commitment to such behaviors. When the results of these studies were synthesized, the results indicated that verbal commitment exhibited the strongest relationship to actual involvement in responsible environmental behavior of any variable considered ($r = .491$). Similarly, when the results from the six personal responsibility studies were synthesized, these results also indicate that there is a strong relationship between it and actual involvement in responsible environmental behavior ($r = .328$). These findings suggest that these are indeed characteristics of environmentally literate individuals.

However, due to the apparent complexity of these variables, knowledge about how a sense of responsibility or a sense of commitment develops in youth is limited. The most relevant bodies of knowledge pertains to the development of pro-social, moral and altruistic behavior (e.g., Bar-Tal, 1976; Enright & Lapsley, 1977; Mussen & Eisenberg-Berg, 1977; Staub, 1978). While such knowledge appears to be generally useful, the exact extent of its utility in the environmental domain is largely unknown. In addition, there are few solid research findings about what kinds of things teachers can do to assist in this development (e.g., Leming, 1981, 1985). Consequently, only several general suggestions can be offered here as to how these variables should be addressed in educational programmes for middle level students or for middle level teachers.

In general, these variables assume a fairly advanced level of personal development with respect to environmental concerns, and for this reason it is easier to work with teachers (adults) than with youth on associated topics. Still, regardless of age, these variables are probably not amenable to educational treatment until a learner exhibits a fairly high degree of sensitivity, and has adequate grounding in the contents associated with Goal Levels I and II. Thus, from a programmatic standpoint, these variables appear to enter the picture when instruction is provided at Goal Levels III and IV.

At that point, there appear to be several opportunities to foster development of responsibility and commitment among learners. First, as with sensitivity, exposure to role models who have developed and who exhibit such responsibility and commitment would seem appropriate. Second, providing learners with opportunities to share their views on responsibility for and commitment to the solution of environmental issues in the context of values-clarifying discussions can be a useful instructional approach. Similarly, providing students with a receptive atmosphere to publicly affirm their values and commitments would also seem to be appropriate. Fourth, as learners are provided with the opportunity to develop and apply the skills associated with these two Goal Levels, it would again be appropriate to engage learners in the discussion of topics related to these variables. Finally, the research literature does provide some evidence that providing learners (at any level) with an opportunity to assume responsibility has the potential to contribute to the development of these variables (Schwartz, 1968, 1975; Heberlein, 1972, 1975; Heberlein & Black, 1974; Van Liere & Dunlap, 1978). As before, opportunities to assume responsibility should probably be offered incrementally, allowing time for learners' to integrate their experiences, reflections and feelings.

It certainly would seem appropriate to utilize these kinds of suggested programme activities to foster the development of a sense of responsibility and commitment in teachers. However, as previously mentioned, the use of such activities must eventually give way to discussions on the nature of and methods for encouraging the development of these in their prospective students.

Selecting an Appropriate Role for Environmental Action in Education

Opinions differ on the role of environmental action (responsible environmental behavior; citizen action) in formal education. Some take the position that it is inappropriate for students to be exposed to action-oriented instruction as part of an educational programme. On the other hand, there are those who take the position that it is appropriate for educators to direct students to take action whether or not that action is consistent with the beliefs and values of the student. The writers disagree with both of these positions. The former runs contrary to mainstream thought in the EE field which calls for active participation in preventing and solving environmental problems (e.g., Stapp, et al., 1969; Harvey, 1976; Tbilisi, 1977; Hart, 1981; Hungerford & Volk, 1984), while the latter overrides important ethical and developmental concerns.

The position the writers take is that it is appropriate to instruct students in the skills involved in responsible citizen action, and to provide students with adequate opportunities to practice and apply those skills in classroom-like situations. In keeping with the role of citizenship in a society, it seems responsible for teachers to support students who decide to engage in some form of action if and when these actions are socially and ecologically responsible, and to counsel students when their proposed actions are not. At no time should a student be forced into acting on an issue in the community or region in which they live. In summary, it is generally agreed that there is an ethical responsibility on the part of environmental educators both to help students become skilled in citizenship roles, and to defer to the student's own beliefs and values in terms of what the student chooses to do (or not to do, as the case may be).

In previous sections, the writers have referred to studies by Ramsey (Ramsey, et al., 1981; Ramsey, 1987), Klingler (1980), Jordan, et al. (1986), and Holt (1988) in which students were provided with training in the skills involved in responsible citizen action. In each study, middle level or high school students became skilled, and were given opportunities to apply those skills. Further, the results from each study indicated that trained students continued to apply those skills on their own to the prevention and resolution of local environmental problems outside of the particular programme setting. Under no circumstances, however, were students forced to engage in any action either as part of classroom instruction or outside of the programme setting.

At the college (teacher education) level, the situation may be slightly different. In the training of teachers who will have a responsibility for teaching youth to become environmentally responsible, it may be appropriate to insist that the preservice teachers demonstrate their skills in a community/regional setting. Even so, while it is probably ethical to insist on some demonstration of these citizen responsibility and action skills, it is not ethical to insist that they engage in any designated action, particularly one which might run counter to the student's beliefs and values. One of the writers of this document has used this strategy successfully. Furthermore, both writers have witnessed instances where an entire class of students have agreed to work cooperatively on a given action strategy/project.

From classroom and research experience in both K-12 and collegiate settings, the kinds of actions students are most likely to select and engage in are not those with serious

political or social overtones. Given the complexities of, and resources required for political and legal actions, these are generally beyond the scope of students' classroom projects. The categories of actions students are most likely to select and engage in consist of consumer, ecomanagement (physical), and persuasive actions. In many cases, students will employ some combination of strategies from these categories in a single action project (e.g., some combination of ecomanagement and persuasion, or consumer action and persuasion strategies). Regardless, it is necessary for any educator to pay careful attention to the kinds of action projects students select, and thereafter engage in. As implied, it is incumbent on the professional educator to make carefully thought out decisions concerning the role of environmental action in a given instructional programme.

Summary

In closing, the preservice teachers themselves must exhibit the characteristics of environmentally literacy. These individuals must embody the experiences, knowledge, skills and attitudes reflected in environmental sensitivity, ecological foundations, the conceptual awareness of problems and issues, issue investigation and evaluation, and environmental action before they can develop those characteristics within their students in a comprehensive and effective manner. Thus, the preservice teacher must ...

... feel comfortable in the outdoors, and in using the out-of-doors for instructional purposes (i.e., as related to the EE goals and to environmental sensitivity).

... develop an understanding of ecological concepts and principles, and learn how to teach those ideas to youngsters in an interesting and effective manner.

... become knowledgeable about a variety of environmental problems and issues, and be able to offer instruction which introduces students to but does not overwhelm them with those problems and issues.

... understand the importance of environmental issue investigation/ evaluation and citizen action, and must develop the knowledge and skills which permit him/her to become actively and responsibly involved in resolving environmental issues and in maintaining a healthy environment. With respect to their teaching, the preservice teacher must not only be prepared to provide their students with sufficient opportunity to develop and apply issue investigation/evaluation and citizen action skills; they must be prepared to do so in a manner which permits their students to develop an internal locus of control, a sense of personal responsibility, and a willingness to commit themselves to the resolution of environmental issues in the future.

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"There is a severe shortage of classroom teachers prepared to effectively integrate environmental education into instructional programs. The traditional approach to the teaching of environmental matters has been for the teacher to become knowledgeable about some aspect of the environment and then to convey this information to the student through the lecture approach. This process has not been highly effective in stimulating sustained interest in environmental affairs or helping students acquire beliefs, attitudes, values, or skills conducive to the development of an environmentally literate citizenry."

W. Stapp, 1974

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PART II

THE NATURE OF THE MIDDLE SCHOOL *

The middle school - regardless of grade level configuration - typically grades 5 through 9 - represents one of the greatest educational challenges of all times. Similarly, in the U.S.A., it represents one of education's greatest failures - a very real crisis - steeped in faculty ineptness, a socially traumatized student body, rampant traditionalism, pathetic teacher education, public and parental hostility, and administrative debacle upon debacle.

The problems which surround this failure are difficult to cope with, particularly when few are willing to admit the crisis and fewer are willing to cope intelligently with it. Of course, one finds evidence of change, brought about by thinking educators and enlightened publics, but these changes tend to be endemic rather than epidemic. Rarely can be seen a groundswell - a rapidly progressing evolution - of thought and practice in middle school education which would swing the pendulum toward the real needs of youngsters and societies. The frustrations of enlightened middle school educators must somehow be dealt with but, even more importantly, the grievous instructional injustices perpetrated against those millions of middle school students throughout the nation must somehow be remedied. Unfortunately, for many, if remediation comes, it will come too late. One can only speculate on the personal and social damage this has caused and will cause in the future.

This particular document focuses on environmental education and, in particular, teacher training for effective environmental education. Part II of this document deals with middle school youngsters, middle school problems, teacher education, and a seriously considered connection between the goals for environmental education in this document and their relationship to an improved middle school education for students. Needless to say, a document of this sort can only begin to deal effectively with the overall "scourge" mentioned above. However, it can help point educators in the right direction. To begin with, some discussion of middle school students - their characteristics and problems - seems relevant.

The Writers

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* - In several instances, the contents of this chapter will sharply reflect the 1989 document entitled Turning Points: Preparing American Youth for the 21st Century - known by many as the "Carnegie Report". Portions of the Carnegie Report are quoted here simply because the authors, who cumulatively represent over twenty years experience at the middle school level, agree with so many of the conclusions and recommendations of that report.

This report [Turning Points: Preparing American Youth for the 21st Century] was prepared by the Carnegie Council on Adolescent Development's Task Force on Education of Young Adolescents. The Carnegie Council is a program of Carnegie Corporation of New York.

The Student in the Middle Years

The middle school is typically configured around a grades five through nine (5-9) format. Atypical middle schools abound. There are five-eight schools, six-nine schools and others. The middle school is supposedly an educational enterprise focused on the needs of youngsters as they move from childhood to full-blown adolescence. Unfortunately, its configuration is often dictated by local conditions, i.e., the needs and financial conditions of the community/school district. Because of this, the middle school is often observed to be a downward movement of secondary education, not dedicated to the real and desperate needs of young adolescence, carrying with it the traditions of secondary education and the many problems and failures encompassed in it as well. Sometimes, but less often, one can observe an upward thrust of elementary education - a far superior model for the middle school compared to secondary education - but still not satisfactory for the youth assigned to it.

Regardless of grade level configuration and educational model utilized, the middle school consists of students representing an array of physical and psychological developments. Many are pre-pubescent while many others are well along their way to sexual maturity or sexually mature in almost every manner in which sexual maturity can be operationalized. These and other physical and psychological variations make for a highly volatile and difficult student population to work with. This development also brings, to the student, a myriad of problems - undoubtedly more than at any other time in his/her life. These range from an intense attention to the peer group and interpersonal relationships to a feeling of inadequacy and a self-concept often in danger of being diminished by peers, parents, teachers and society at large. Coupled with the frightening experience of sexual development, these problems constantly serve as a framework around which potential disaster is never far away.

Additionally, the middle years, for students, are characterized by rapid intellectual development. Middle school students have a capacity for thinking in much more abstract ways than they did in the lower grades. Typically, the move from concrete to formal operational thinking is taking place although middle school students exhibit a wide array of intellectual thinking. Still, this capacity for intellectual development holds tremendous promise for them and for society in general. Critical thinking - promoted so vigorously in this document - can, then, be taken to considerable lengths by well-trained and competent teachers, working with curricula which are organized in such a manner as to downplay factual learning and promote higher order thinking skills, e.g., synthesis and evaluation.

Concurrent with the development of critical thinking skills in the classic sense comes an opportunity for the development of sound decision making. The typical middle school student, surrounded by wildly mixed messages from society (from adults, peers, TV, radio, and print media), has an inordinate problem sorting out his/her values. The school should - nay, must - turn potential disaster for the student (e.g., drugs, suicide, promiscuous sexual behavior, crime, sexually transmitted disease, school drop out, teenage pregnancy) into into a carefully thought out opportunity for rational decision making. Not only should the opportunity present itself, it should be consummated both vertically and horizontally in the curricular structure of the school.

A major characteristic of the early middle school youngster is his/her tendency toward egocentrism (the "I" syndrome). Middle school students typically look to themselves as the major variable in space and time. This self-centrism tends to block important socializing experiences and concepts. Because the emerging adolescent shows little sense of history and is limited in the ability to project extensions of a present event or condition

into the future (George and Lawrence, 1982), there is little acknowledgement of the effects of present behavior on future events. However, as development proceeds, students have the ability to learn that the future depends, at least in part, on choices made in the present. Thus, instruction can help mold concepts and attitudes associated with cause and event, not only in a scientific dimension but in personal and social dimensions as well. Similarly, the student can be helped to evolve from a thoroughly egocentric model of thinking toward what is often called a sociocentric perspective where he/she is no longer the center of the universe. This helps give the student a sense of community and of the individual's role in society. It is extremely interesting to note that numerous middle school teachers who have implemented the environmental education curriculum recommended in this document have commented that, subsequent to instruction, students appear to be more altruistic, i.e., interested in and concerned about society, not just interested and concerned for themselves any more.

Certainly, many middle school students feel disenfranchised (i.e., left out) by society. They are supposedly too young to be sexually active, they have no opportunities in most legitimate work places (albeit home responsibilities, most possibly greater in agrarian societies), educators often talk down to them instead of to them, they are too young to be adults, and they are told to be responsible without being given meaningful responsibility. And, society tends to evolve in ways which negate finding "new" roles for them as citizens. Here, again, the school has a tremendous opportunity to provide meaningful citizenship experiences for students. As has been discussed in Part I of this document - and as will be discussed in more detail in future parts - an environmental education which focuses on the goals proposed here will go far in reenfranchising the middle school student. Needless to say, environmental education is only one step in this process. Other opportunities must also be employed. Environmental education, perhaps, holds the key to a solid beginning for helping to make middle school students good citizens in their communities and, at the same time, giving them a feeling of being enfranchised by society.

It might help, at this point, to use a table prepared by Wiles and Bondi (1981) which summarizes the intellectual and affective characteristics of emerging adolescents and the instructional implications associated with those characteristics.

Characteristics	Instructional Implications
Emerging adolescents display a wide range of skills and abilities unique to their developmental patterns.	A variety of materials and approaches in the teaching-learning process should be utilized in the middle school.
Students will range in development from the concrete-manipulatory stage of development to the ability to deal with abstract concepts. The youngster is intensely curious and growing in mental ability.	The middle school should treat students at their own intellectual levels providing immediate rather than remote goals. All subjects should be individualized. Skill grouping should be flexible. *
Middle school learners prefer active over passive learning activities; prefer interaction with peers during learning activities.	Physical movement should be encouraged with small group discussions, learning centers, and creative dramatics . . . Provide a program of learning that is exciting and meaningful.

Students in the middle school are usually very curious and exhibit a strong willingness to learn things they consider to be useful. Students enjoy using skills to solve "real-life" problems.	Organize curricula around real-life concepts . . . Provide activities in both formal and informal situations to improve reasoning powers. Studies of the community, environment are particularly relevant to the age group.
Students often display heightened egocentrism and will argue to convince others to clarify their own thinking. Independent, critical thinking emerges.	Organized discussions of ideas and feelings in peer groups can facilitate self-understanding. Provide experiences for individuals to express themselves by writing and participating in dramatic productions.

* - The writers of this Unesco document would recommend that "individualized instruction" be viewed holistically rather than traditionally, i.e. traditional meaning isolated instruction, similar to programmed learning where learning takes place between student and materials rather than between students themselves or the student interacting with the teacher. The concept of individualized instruction at the middle school level should include *active involvement* in research projects in numerous academic areas (including environmental education) which permits individuals or very small groups of students to probe a problem or issue at their own level(s) of ability. It should also include the notion that students, as individuals, can work effectively in a cooperative learning program where the group (as well as individual students) has a responsibility for utilizing the mix of abilities within the group for the learning achievement of every group member. In other words, the concept of "individualized instruction" must be expanded to incorporate a number of methodologies not typically associated with it.

Unfortunately, if one looks at the typical middle school today, it is a far cry from the school that is designed and dedicated to meeting the needs of today's youth. As noted in the introduction to this part and elsewhere, the reasons are many. This document is not intended to present a discrepancy model of *what is* compared to *what should be*. Perhaps it will suffice, instead, to present a model of a satisfactory middle school - one which meets not only the needs of students but of society as well.

What Should the Middle School Look Like?

It should be very clear, at this point, that the middle school should be a very unique place, quite different from the elementary school which precedes it and the secondary school beyond. And, more importantly perhaps, it should be staffed by professionals who are thoroughly trained in middle school education and totally dedicated to helping students mature educationally, psychologically, socially, and physically. That this is a challenge of considerable proportions goes without saying.

As noted in the footnote on the first page of Part II, the writers are very impressed with the bulk of a recent document, commonly referred to as "The Carnegie Report" (1989). In this report we find a section entitled, "Recommendations for Transforming Middle Grade Schools", i.e., middle schools. What follows are those recommendations with which the writers wholeheartedly agree, contained in The Carnegie Report:

". . . The [Carnegie Council on Adolescent Development's] Task Force calls for middle grade schools that:

^ *Create small communities for learning* where stable, close, mutually respectful relationships with adults and peers are considered fundamental for intellectual development and personal growth. The key elements of these communities are schools-within-schools or houses, students and teachers grouped together as teams, and small group advisories that ensure that every student is known well by at least one adult.

^ *Teach a core academic program* that results in students who are literate, including in the sciences, and who know how to think critically, lead a healthy life, behave ethically, and assume the responsibilities of citizenship . . .

^ *Ensure success for all students* through elimination of tracking by achievement level and promotion of cooperative learning, flexibility in arranging instructional time, and adequate resources (time, space, equipment, and materials) for teachers. . . .

^ *Staff middle grade schools with teachers who are expert at teaching young adolescents* and who have been specially prepared for assignment to the middle grades.

^ *Improve academic performance through fostering the health and fitness* of young adolescents, by providing a health coordinator in every middle grade school, access to health care and counseling services, and a health-promoting school environment.

^ *Reengage families in the education of young adolescents* by giving families meaningful roles in school governance, communicating with families about the school program and student's progress, and offering families opportunities to support the learning process at home and at the school.

^ *Connect schools with communities*, which together share responsibility for each middle school student's success, through identifying service opportunities in the community, establishing partnerships and collaborations to ensure students' access to health and social services, and using community resources to enrich the instructional program and opportunities for constructive after-school activities."

What Characteristics Should the Student Product of the Middle School Reflect?

Certainly, if we believe that middle school youth are very special human beings and, certainly, if we believe that the middle school should look substantially different from the elementary school preceding it and the secondary school beyond, then we must have in mind a special set of goals for the school itself.

Turning once again to the "Carnegie Report" we find, in the Preface, a list of five characteristics prepared by David W. Hornbeck, Chair of the Task Force on Education of Young Americans. Hornbeck asks, "What do we want every young adolescent to know,

to feel, to be able to do upon emerging from that educational and school-related experience?" Further, he writes,

> Our answer [the Task Force's] is embodied in five characteristics associated with being an effective human being. Our 15-year-old will be:
>
> ^ An intellectually reflective person;
> ^ A person enroute to a lifetime of meaningful work;
> ^ A good citizen;
> ^ A caring and ethical individual; and
> ^ A healthy person.

As was noted earlier, the present document's focus is on the preparation of teachers to teach environmental education effectively at the middle school level. The document is not intended to be a holistic document on the middle school per se. Even so, it would be wise for middle school administrators and practitioners to take pause and consider carefully the five characteristics listed above. They certainly sound substantial and appropriate, don't they? But, when one begins to operationalize them, difficulties occur. What is an intellectually reflective person? What is a good citizen? What is a caring and ethical individual? What are the attributes - the behaviors - the skills - the attitudes - the educational precursors for these characteristics?

The Goals for Environmental Education at the middle school level, stated and described in Part I and explicated elsewhere are particularly important ones for two of the characteristics stated above. The two characteristics, above, which are closely allied to the environmental education goals are: (1) An intellectually reflective person and, (2) A good citizen.

Again, turning to the "Carnegie Report" and the discussion of these two characteristics, we find attributes in close harmony with the goals of this document. We quote:

> "AN INTELLECTUALLY REFLECTIVE PERSON . . . Our youth will be able to analyze problems and issues, examine the component parts, and reintegrate them into either a solution or into a new way of stating the problem or issue. In developing thinking skills, the youth will master self-expression and be able to 'hear' others' expressions through diverse media. These skills of self-expression and hearing include persuasive and coherent writing, articulate verbal expression, . . . A GOOD CITIZEN . . . our 15-year-old will accept responsibility for shaping and not simply being shaped by surrounding events. Central to demonstrating good citizenship is a youth who is a doer, not just an observer. . . . Finally, our young adolescent's good citizenship will be embodied in a positive sense of global citizenship. That involvement will reflect an appreciation of both the Western and non-Western worlds. The youth will possess a feeling of personal responsibility for and connection to the well-being of an interdependent world community."

It must be clear, now, to the reader, that the environmental education goals expressed in this document are, indeed, important ones not only for the environment but for the middle school student as well. The welfare of the environment aside for the moment, what are some examples of the harmony that exists between environmental education goals and the desired outcomes for middle school youth?

Intellectual Reflectivity

This document proposes that every middle school student should be able to analyze issues, i.e., become skilled at being able to dissect the anatomy of issues. In doing so, the student must identify the various "players'", their positions, beliefs and values. This analytical skill demands that students conceptualize (i.e., reflect upon) the components of the issues, understanding although not necessarily agreeing with differing viewpoints and the substantive or nonsubstantive arguments supporting these viewpoints. Certainly, at times, there should arise a certain empathy with opposing positions/viewpoints. The ability to conceptualize and empathize with differing beliefs and values is, by some estimates, at the heart of "reflectivity". Similarly, there exists a great deal of reflectivity in planning for citizenship action, particularly when the students evaluate proposed solutions against what are termed "Action Analysis Criteria". This reflectivity, combined with the ability to synthesize (i.e., reintegrate) the component parts of an issue, goes a long way in helping to meet the intellectual reflectivity goal expressed in the Carnegie Report.

Good Citizenship

This document proposes that every middle school student should not only investigate EE issues in depth, but should also take part in planning for the remediation or partial remediation of those same issues. In so doing, the student must carefully construct an "Action Plan" which outlines precisely the steps involved in planning for responsible citizenship action regarding environmental issues. Further, the actions chosen by the students are "filtered" through the "Action Analysis Criteria" mentioned above in order to make certain that the students understand the ramifications - positive and negative - of the selected actions. Finally, the student may choose to implement the action(s) or not depending upon his/her level of involvement with the issue in question. Many, many middle school students have opted to follow through with their action plans and many have accomplished remarkable things toward the improvement of the environment. These actions constitute the epitome of good citizenship, a highly desired characteristic of the middle school student. Even if the action is not implemented, the student has had experience planning for and evaluating citizenship actions that focus on very real issues in the environment.

Thus, it should becoming increasingly clear that good environmental education not only holds promise for the environment, it holds considerable promise for helping to meet important student-centered goals at the middle school level. And, too, as instructional methodology recommendations will show, the model of environmental education proposed in this document, will conform extremely well to the recommended profile of the middle school itself, e.g., engaging students in group activity, organizing the curriculum around real-life concepts, providing activities to enhance reasoning powers, implementing studies of the community and environment, and providing opportunities for individuals to express themselves in writing and verbally.

What Characteristics Should the Teacher of the Middle School Reflect?

It is obvious, from all the preceding in Part II, that a "typical" teacher and a "typical" teacher education programme will not suffice at the middle school level. Again, this document is not designed to be a thorough overview of middle school education. Still, it would be careless of the writers not to focus some attention on the personal and professional characteristics needed by the middle school teacher.

The National Middle School Association (U.S.A.), in 1986, prepared a position paper entitled, "Professional Certification and Preparation fort the Middle Level". In this paper, the association describes both personal and professional competencies needed at the middle grades. These descriptions, somewhat generic but nevertheless appropriate, appear worthy of repetition here. They follow:

Personal Qualities

Effective teaching at the middle grades level requires to a high degree the personal qualities long associated with successful teaching at any level, including energy, enthusiasm, sensitivity, fairness, and a sense of humor. In addition, the characteristics and needs of the transescent [preadolescent-adolescent] give heightened importance to the following teacher characteristics, each of which parallels a major concern of the middle grades student:

1. *Positive view of self.* Students who are struggling to establish their own self concepts need teachers who have a strong sense of personal identify . . . and who are well adjusted to life.

2. *Flexibility, openness to change.* Rapid change is the hallmark of transescence. Teachers at this level must demonstrate how to live with change and still maintain personal integrity. They can admit and live with their own errors. They must have the emotional strength to live with the ups and downs of transescents.

3. *Respect for the dignity and worth of each individual.* Transescents are more diverse than any other age group. It is essential that teachers demonstrate how to respect each person's uniqueness and value his/her being, thus modeling a personal commitment to a value system supportive of . . . society.

4. *Willingness to cooperate with other staff members, parents, students, and others to achieve common goals.* Getting along with others, especially peers, is a dominant concern of transescents. They need teachers who demonstrate effective human relations skills in a spirit of cooperation rather than competition.

5. *Commitment to transescents.* Is willing to devote time and personal concern to the student in and out of the classroom; has a great deal of patience and readiness to listen. This is a time when life often seems overwhelming . . . A teacher who cares is especially important during the middle grades.

6. *Commitment to education.* Seeks further knowledge and training to keep current about learning and teaching. Transescents are searching for values, careers, life goals. A teacher who demonstrates commitment provides a valuable model.

Teacher Competencies

The effective middle grades teacher:

1. Demonstrates, in every aspect of the teaching/learning relationship and process, a sensitive and caring concern for 'kids' at this age.

2. Understands the physical, emotional, intellectual, and moral development of the transescent and plans the teaching/learning process to facilitate that development.

3. Creates a positive classroom learning environment, uses a variety of instructional techniques, and organizes the curriculum to adapt to the learning patterns of each student.

4. Facilitates students' personal growth through instructional procedures, content of the curriculum, and personal relationships.

5. Works cooperatively with other teachers, staff members, parents, resource persons, and community groups.

6. Teaches communication skills such a reading, listening, writing, and speaking as an integral part of instruction in all subjects.

7. Provides opportunities for students to become independent learners.

8. Maintains classroom control appropriate to the type of learning being carried out and deals effectively with unusual problems.

9. Develops increasing breadth and depth in own teaching field(s) and relates that learning with other areas of the middle grades curriculum.

10. Constructively participates in the design, implementation, evaluation, and revision of the curriculum.

11. Uses evaluation, marking, and reporting procedures which enhance the self-concept of the transescent.

12. Helps to create a classroom and a school environment, curriculum, and instructional procedures appropriate for students according to their special physical, mental, and emotional needs.

Characteristics of a Sound Teacher Preparation for Working in the Middle School

Far too often, teachers at the middle school level find themselves in what might be termed a "no man's land" - caught by their training in a school environment for which they are unprepared. Middle school teachers are, rather typically, those that have been trained as either elementary or secondary school teachers and who, for one reason or another, find themselves assigned to the middle grades. In some instances, the elementary trained teacher can be quite successful, simply because he/she brings to the middle grades attributes which are appropriate for use with the students, e.g., an ability to work with small groups, a broad spectrum of training in a number of content areas, and an ability to

apply interdisciplinary instructional techniques. But, in the final analysis, very special training in middle school education is needed by most middle school personnel in order to be maximally effective.

The question of the training of middle school educators is a very difficult one. There are varying positions on what that training should look like.

One on hand it is recommended that the middle school teacher should have indepth training in at least two content areas with an optional concurrent undergraduate observation schedule in a typical middle school. This means that the bulk of the undergraduate programme would be in the academic arena with few "education courses" to serve as a foundation for middle school instruction. Professional education courses would be taken at the graduate level while the teacher serves a professional internship in the middle school under the direction of both middle school and professional "mentors".

On the other hand, is is often recommended that the middle school teacher be trained in the "classic sense" in a teacher education programme designed specifically for certification at the middle school level. In this scenario, one would observe the preservice teacher gaining a degree of depth in two content areas, becoming familiar with the developmental aspects and characteristics of the middle school youngster, studying the middle school curriculum, learning about methods and materials appropriate for the middle school learner, and how to work effectively with the student in an advisory or guidance role.

Needless to say, this document cannot resolve arguments about how the middle school teacher should be trained overall. However, the contents of this document lean toward the "classic model" of teacher preparation (with the major exception that this publication deals specifically with the training of environmental educators for work in the middle school). With a more "traditional model" in mind, the writers, below, present recommendations for certification as outlined, once again, by the National Middle School Association (U.S.A.) in 1986.

Pre-Service Preparation

Middle grades teaching requires pre-service preparation essentially similar to that provided in most elementary or secondary education programs, but with certain special emphases.

It should differ from *elementary* teacher preparation as follows:

1. Depth in one or two teaching fields, in addition to the diversified subject-matter preparation ordinarily required of elementary teachers.

2. Examination of the history, philosophy, and curriculum of the middle grades, both in and outside the school setting.

3. Special attention to
   a. the characteristics and needs of the transescent.
   b. the development of the skills of continued learning in and through instruction in such courses as reading, English, social studies, science, mathematics, foreign language, home economics, etc.
   c. the guidance/advisory role of the teacher during transescence.

4. Methods and materials especially appropriate for middle grades students.

Preparation for middle grades teaching should differ from *secondary* teacher preparation as follows:

1. Modest depth of preparation in two teaching fields, rather than [indepth] specialization in one.

2. Examination of the history, philosophy, and curriculum of the middle grades.

3. Special attention to
   a. the characteristics and needs of the transescent.
   b. the development of the skills of continued learning in and through instruction in courses as English, social studies, science, mathematics, foreign language, home economics, etc.
   c. the guidance/advisory role of the teacher during transescence.

Throughout the program, [teacher education programme] students should have opportunities to observe and to work with transescents, both to enhance their rapport with the age group and to enable them to decide whether they really want to teach at this level."

In Closing

It is evident, from the above, that the middle school must meet some very serious needs of transescents. Although very serious problems abound, very real opportunities also abound! The middle school has tremendous opportunities to facilitate the intellectual, emotional, and physical growth of these students. This document recommends very specific goals for environmental education - both for middle school students and adults involved in teacher education programmes. These goals reflect a curriculum and instructional methods which will go far in helping both the environment and middle school students.

It was noted, earlier in Part II, that two of the major objectives for the middle school were to develop an intellectually reflective person and a good citizen. Comments were tendered that showed a relationship between what is recommended on other pages of this document and these two objectives. However, not mentioned were other positive ramifications for middle school students.

In order to provide instruction which will help meet these objectives as well as the goals for environmental education, the instructor must be able to help students work in small task-focused groups and, further, be able to work as a consultant/advisor as individuals actually investigate environmental issues of their choice and develop action plans to help remediate these same issues. These things simply cannot be done on a large-group basis because, to do so, would violate the essence of the program. What is intended here is to produce a very mature autonomous investigator who is able to think critically, acquire good inquiry skills, solve real problems, make responsible decisions as a community member, and develop a sense of ownership in the educational process and empowerment as a citizen in the very real world. If the world community wishes to produce adolescents who feel culturally and socially enfranchised rather than disenfranchised, implementation of the recommendations of this document will certainly help facilitate this.

PART III

PREPARING MIDDLE SCHOOL TEACHERS IN ENVIRONMENTAL EDUCATION

> "Teachers should learn to work as members of a team and, within the team framework, to design and help teach interdisciplinary, developmentally appropriate programs of study. As members of a team, teachers will be responsible for educating other teachers about the importance of key principles, concepts and facts within their discipline, and for working with colleagues to find common ground in the subjects they teach .... [An undergraduate education should provide prospective middle grade teachers with a core of solid knowledge in one or more subject areas."
>
> Carnegie Council on Adolescent Development, 1989

Premises for Developing a Specialization in Environmental Education

Seven major premises underlie and were used to guide the development of this Specialization in Environmental Education.

1. This part of the document will present a Teacher Education Programme Specialization. Thus, the coursework presented here is not intended to represent an entire Teacher Education Programme (TEP), but rather one part of it. It is clearly recognized that middle level programmes are likely to include a host of other general education and specialized content courses, as well as variety of educational foundations and methods courses.

2. The preservice TEP, and the associated Specialization should be presented as a baccalaureate degree course of study, rather than as an associate or graduate degree programme.

3. The authors recognize that requirements for content and education courses in middle level TEPs will vary widely from one institution (or country) to another. For this reason, the authors have attempted to create a Specialization which can be adapted to fit several the more common types of middle level TEPs (e.g., see Alexander & McEwin, 1988). It is crucial that users of this document attempt to understand and adapt this Specialization to their own middle level TEP, certification, and schooling conditions.

4. This Specialization should be adaptable for use in TEPs in many areas of the world. Thus, Specialization coursework should reflect internationally accepted guidelines in the area of specialization, environmental education (EE). In this case, the guidelines for EE accepted at Tbilisi (Unesco, 1978), and reaffirmed at "Tbilisi Plus Ten" (Unesco/UNEP, Sept., 1987) have been woven into the fabric of this Specialization. In addition, Special-

ization courses should be developed so that their contents are applicable or adaptable to environmental conditions apparent in many, if not most regions of the world. Nonetheless, the authors wish to encourage readers to tailor the contents of courses in this Specialization to reflect ecological and environmental conditions of interest and importance in their region.

5. Since this is a TEP Specialization in Environmental Education (SEE), it should include adequate coursework in environmental education. This coursework should, by design, reflect the goal structure of environmental education, and should adequately prepare middle level teachers to help their students realize these goals.

6. In addition to environmental education coursework, this TEP Specialization should also consist of coursework from two major disciplinary areas. As has been suggested by the National Middle School Association (1986), and more recently by the Carnegie Council on Adolescent Development (1989), it is appropriate to prepare middle level teachers in more than one subject area, since this should enhance interdisciplinary offerings and teaming efforts at the middle level. A sizeable number of middle level teacher preparation programmes in the U.S. already require two or more areas of academic concentration (Alexander & McEwin, 1984, 1988).

> Two fields of academic concentration are generally required at the undergraduate level to broaden the perspective of preservice teachers and to make implicit the relationship between various subject areas, for example between mathematics and science. This gives preservice candidates more academic specialization than elementary teachers, but not as narrow a specialization as that required of secondary teachers. Additionally these academic concentrations usually include a variety of disciplines within each academic area. For example, a social studies academic concentration may include courses in history, geography, economics, anthropology, and political science rather than the single subject specialization taken by secondary majors which may focus only on political science or history.
>
> National Middle School Association, 1986, p. 6

7. In the context of this Specialization, it seems prudent to prepare teachers in the two disciplinary areas which contribute most to an understanding of environmental topics, and, as might be expected, which represent the two K-12 school subjects in which environmental education is most commonly taught: the sciences and the social studies (Childress, 1978; Disinger, 1981). Thus, this Specialization will include coursework in these two subject areas. This is not to say that other subject areas do not or cannot contribute to middle level environmental education efforts, for the authors clearly recognize that middle level schools would do well to also have mathematics and language arts teachers who are prepared to work with students on environmental topics and projects (Childress, 1978; Hart, 1981). Readers interested in adapting the strategy used here (for science and social studies) for use in other subject areas are encouraged to do so (see Hungerford, Ramsey, & Volk, 1989).

Using Content and Methods Courses in the Specialization

In order to adequately prepare teachers in their areas of academic concentration, as well as in environmental education, a Specialization in Environmental Education (SEE) must include content courses which cover the major subject matter in each area, and meth-

ods courses which reflect disciplinary and interdisciplinary approaches to teaching in those areas. Given the aforementioned premises and this reasoning, the TEP/SEE should include coursework in the content and methods of environmental education, in the sciences and science education methods, and in the social sciences and social studies education methods.

As noted under the premises, coursework in environmental education should adequately reflect the set of environmental education goals one adopts, and should prepare middle level teachers to help their students realize those goals. Thus the goals adopted should be used as a general guideline in selecting and organizing environmental content and methods courses. With respect to content, since the set of goals presented in Part I of this document posits knowledge of ecology as foundational, it is imperative that teachers be provided with coursework in ecology. Similarly, awareness and knowledge of environmental issues are also seen as important within those goals, and so, teachers should be provided with adequate coursework covering various types and aspects of environmental issues. The contents associated with ecology and issues are usually well understood, and consequently are more commonly addressed in teacher education and in K-12 programmes (Childress, 1978). On the other hand, contents associated with issue investigation, environmental solutions, and citizen action are not as well recognized, and therefore are not commonly addressed in teacher education (Peyton & Hungerford, 1980; Wilson, 1988), or K-12 programmes (Childress, 1978). The authors strongly recommend that sufficient attention must be given to contents associated with each goal level in content coursework.

In addition to understanding contents associated with each goal level, teachers must be provided with methods coursework which will help them organize and deliver effective instruction at each goal level. Again, the methods associated with the teaching of ecology and issues are usually better attended to in teacher education programmes than are methods associated with teaching at Goal Levels Three (the Issue Investigation and Evaluation Level) and Four (The Environmental Action Skill Level). For this reason, the authors also recommend that sufficient attention be given to those methods which have proven instructionally effective at each goal level. Interested readers are referred to the extensive discussion of methods associated with all four goal levels in Part IV of this document.

Given the importance of science and social studies in environmental education and in middle level education, several content courses from each of these subject areas have been selected for inclusion in this Specialization. Many middle level certification and teacher preparation programmes require preservice teachers to complete content coursework in science and in social studies/science (Alexander & McEwin, 1988). While the number and type of required content courses in each area varies across institutions (or countries), it appears to be common for teachers to complete several courses in each area as part of their professional preparation. Thus, commonly offered and required courses, particularly survey-type courses, were considered. In addition, recommendations for the design of middle level programs in science (Blosser, 1983; Childress, 1983; Stronk, 1986; NSTA, 1987), and in social studies (Allen & McEwin, 1983) were consulted during course selection and design since TEPs should adequately prepare teachers in light of these. The final rationale for the selection of particular science or social science courses was that topics in each selected course should be useful in addressing important aspects of environmental issues.

Middle level preservice teachers enrolled in a TEP/SEE of this type will often be required to teach in traditional school programmes organized around disciplinary lines. For this reason, these teachers must also be adequately prepared to successfully teach science and/or social studies. Within the SEE, the authors have suggested that preservice teachers complete both a science education and a social studies education methods course. Each methods course should emphasize those curriculum guidelines and designs, and those

instructional models and strategies appropriate to teaching that subject area at the middle level.

However, since the science and social studies methods courses are considered to be a part of the SEE, effort should also be made to highlight those curricular and instructional topics which each has in common with environmental education. Thus, each of these methods courses should help prepare teachers to include environmental topics when teaching in either subject area (i.e., using infusion strategies), as well as to address topics from the vantage point of either subject area when teaching within interdisciplinary programs on environmental topics (e.g., as a science or social studies teacher on a teaching team). This is a crucial part of the SEE, and will therefore require methods course instructors who are competent and willing to teach for these skills, and to reflect this in their methods course syllabi.

Infusing Environmental Content, Skills, and Methods into Subject Area Courses

There appears to be a consensus in the fields of environmental education and environmental studies that environmental topics are best taught using the insights from various disciplines (Unesco, 1978; Hart, 1981; Harde, 1984). From a curriculum standpoint, there have been two general methods used to teach environmental topics this way: (a) the "interdisciplinary" approach, whereby various subject areas are used within a single environmental course; and (b) the "multi-disciplinary" approach, where environmental topics are dispersed, or "infused" into various single disciplinary courses (Hungerford & Peyton, 1980).

Both approaches have educational value. Consequently, some argue that both should be used within EE programmes. Since environmental coursework will be offered as part of this TEP/SEE, it is certain that these courses will make use of the interdisciplinary approach. In addition, since science and social studies/science courses will also be offered as part of the TEP/SEE, a multi-disciplinary approach will be used to "infuse" environmental topics into these courses. In fact, it previously was pointed out that particular content courses were selected because of their potential contribution to a deeper understanding of complex environmental issues. It was also pointed out that areas of commonality between the environmental education and subject area methods courses should (and would) be highlighted. The latter two points underscore the potential for and the importance of "infusion" as a strategy within this TEP/SEE. And, since readers are likely to be more familiar with the structuring of "interdisciplinary" environmental courses than with multi-disciplinary infusion strategies, the latter will be discussed here in some detail.

Infusion is a relatively simple process to understand, but a rather complex process to accomplish. Simply stated, infusion refers to the integration of content and skills into existing courses in a manner which addresses the select content/skills without jeopardizing the integrity of the courses themselves. In the case of environmental education, the educator carefully analyzes existing courses for places where environmental content and associated skills could be incorporated and taught.

Infusion into Middle Level Courses.

With respect to this TEP/SEE, there are two levels at which one may undertake infusion: (a) the middle school level; and (b) at the TEP level. In order to accomplish the former, it is almost necessary to undertake the latter, and thereby model infusion for teach-

ers as part of their TEP/SEE. Over the past few years, the writers of this document have spent a good part of their professional lives training teachers in environmental content and issue investigation/action strategies. One of the things to come out of this training is the knowledge that environmental content and skills can often be integrated into existing courses without interfering with the content and skills desired by the participating teachers.

Where can important environmental content and skills be infused? Let us look at an example. In a middle school in New Jersey (USA), there was an interest in implementing environmental issue instruction using a team teaching approach (i.e., by infusing issue instruction into science, social studies, and language arts). The science teachers easily saw the coverage of science content in the study of environmental problems/issues. The social studies teacher, concerned that her students had an opportunity to study social problems, also had little problem seeing the relationship between environmental issues and social issues, since all environmental issues have a large and important social dimension. The language arts teacher was skeptical - unsure whether this infusion would interfere with his program of skill development in language arts. Even so, he agreed to study the components of issue investigation and respond to the challenge a day later. He came back to the group the next day and stated that the language processes involved in issue instruction would meet over fifty percent (50%) of his course objectives. The main point here is that the teachers were able to clearly recognize how content or skills in their subject area would be covered if they used environmental issue investigation as their mode of curriculum organization.

The writers can cite numerous examples of two teachers working cooperatively - typically science teachers working with social studies teachers (or with language arts teachers) to meet the needs of learners. In all instances some form of infusion was involved. Usually the science teacher prompted the team-teaching and the infusion, but not always. Sometimes, the social studies teacher led the way. It matters not who initiated it! What matters is that infusion and cooperative teaching strategies were used.

In a recently completed environmental education middle school curriculum, Hungerford, Ramsey and Volk (1989) presented a series of three tables in which they highlighted the potential for infusing the environmental topics outlined for each of their environmental education courses into other subject areas. Those tables are reproduced on the following pages to illustrate the potential for content infusion. Additionally, a table highlighting the potential for infusing EE skills into other subject areas is also presented. Collectively, these four tables indicate how the results of an infusion analysis might be portrayed.

Infusion Possibilities for:
Year One: Ecological Foundations and Man as an Ecological Factor

Outline Topic	SC	HE	SS	MA	LA	HO	AG
Key: SC = Science; HE = Health; SS = Social Studies; MA = Math; LA = Language Arts; HO = Home Economics; AG = Agriculture							
I. What is Ecology? What do Ecologists Do?							
A. Defining "ecology"	X						
B. The role of ecologists	X		X				X
II. Individuals, Populations, and Levels of Organization in Ecology	X						
III. The "Ecosystem Concept" Developed							
A. Importance of the concept	X						
B. Local/regional ecosystems	X						
C. Components of ecosystems	X						X
D. Ecological niches	X						X
E. Competition . . .	X						X
F. Tolerance ranges . . .	X						X
IV. Energy and Ecosystems							
A. The need for energy . . .	X					X	X
B. The sun as the source . . .	X					X	X
C. Green plants as the basis . . .	X						X
D. Energy losses . . .	X					X	X
E. Net primary productivity . . .	X						X
V. Ecological Succession . . .							
A. Succession as a natural phenomenon	X						X
B. Succession as an orderly phenomenon	X						
C. Major categories . . .	X						X
D. A comparison of stages	X						
VI. Populations and Their Dynamics	X						X
VII. Man As An Ecological Factor							
A. Man as a powerful variable	X		X				X
B. Man as an eruptive population	X		X	X			
C. Consequences of eruptive human populations	X		X			X	X
D. Man and the world's soils			X				X
E. Man and the world's forests	X		X				X
F. Man and the world's wetlands	X		X				X
G. Man and the world's wildlife	X		X	X			
H. Critical considerations . . .	X		X				X

Infusion Possibilities for:
Year Two: Environmental Science & Environmental Health

Outline Topic	SC	HE	SS	MA	LA	HO	AG
I. Man: His History of Resource Consumption							
A. Early Man: hunters/gatherers			X				
B. Agricultural societies	X		X				X
C. Industrial societies	X		X				
D. Relation of population . . .	X	X	X	X		X	X
II. Soils and Allied Problems							
A. A definition . . .	X						X
B. Man's dependency . . .	X						X
C. Soil formation	X						X
D. Soil erosion	X						X
E. The link between human population/soil erosion			X				X
F. Soil conservation strategies							X
III. Water and Allied Problems							
A. The world's water supply	X		X				
B. Renewing the water supply	X		X				
C. Problems with water resources	X		X				X
D. Management strategies	X		X				X
E. Water conservation	X		X			X	X
IV. Food Production and Hunger							
A. The food that feeds the world	X		X			X	X
B. Food chain energy losses . . .	X					X	X
C. Characteristics of agricultural systems	X		X				X
D. World food problems	X	X	X			X	X
E. The green revolution	X						X
F. . . . unconventional food plants	X					X	X
G. Increasing utilization of fish	X					X	X
H. Sustainable agriculture			X				X
I. Responsibilities of the individual . . .			X				X
V. Forest Resources							
A. Importance . . .	X		X				
B. Short term vs long term benefits. . .			X				
C. The world's forests			X				X
VI. Air Pollution							
A. Sources of air pollution	X		X				
B. Major pollutants	X	X					
C. Impact on human health	X	X					
D. Acid precipitation	X	X					X

Key: SC = Science; HE = Health; SS = Social Studies; MA = Math; LA = Language Arts; HO = Home Economics; AG = Agriculture

Outline Topic	SC	HE	SS	MA	LA	HO	AG

Key: SC = Science; HE = Health; SS = Social Studies; MA = Math; LA = Language Arts; HO = Home Economics; AG = Agriculture

VI.							
E. Indoor air pollution	X	X				X	
F. Ozone depletion	X	X				X	
VIII. Water Pollution							
A. Sources of surface pollution	X						X
B. Human diseases traced to . . .		X				X	
C. Oceanic pollution		X					
D. Ground water pollution	X	X				X	X
E. Waste water treatment	X	X				X	
IX. Noise Pollution							
A. Sources and levels	X						
B. Effect of noise on humans	X	X				X	
C. Noise control	X	X	X			X	
X. Solid Waste Disposal							
A. Solid waste defined		X				X	
B. Sources of solid waste		X				X	X
C. Sources of municipal waste		X				X	
D. Affluent/nonaffluent nations			X	X			
E. Methods of municipal waste disposal		X				X	
F. Source reduction of wastes	X		X			X	X
G. Issues surrounding solid waste management	X	X	X			X	X
H. The individual . . .			X			X	X
XI. Hazardous Waste							
A. Hazardous waste defined	X	X				X	X
B. Sources of hazardous waste	X					X	X
C. Hazardous waste disposal in the past	X					X	X
D. Hazardous waste disposal today	X					X	X
E. Issues surrounding hazardous waste disposal	X		X			X	X
F. The individual . . .			X			X	X
XII. Human Population Growth and Control							
A. No population can sustain limitless growth	X			X		X	
B. Human population dynamics	X		X	X		X	
C. Age structure	X		X	X			
D. Issues associated with . . .	X		X			X	X
E. Economic development and population changes			X	X		X	
F. Advantages of family planning combined with economic development		X	X			X	

Outline Topic	SC	HE	SS	MA	LA	HO	AG
XII.							
G. Immigration and population dynamics			X				
H. Birth control and population dynamics		X				X	
I. Major issues . . .	X	X	X			X	

Key: SC = Science; HE = Health; SS = Social Studies; MA = Math; LA = Language Arts; HO = Home Economics; AG = Agriculture

Infusion Possibilities for:
Year Three: Issue Investigation and Citizenship Action Training

Outline Topic	SC	HE	SS	MA	LA	HO	AG
I. Environmental Problems Solving							
A. Human-environment interactions	X		X				
B. Quality of life vs quality of the environment	X	X	X			X	X
C. Environmental problems and issues	X	X	X			X	X
D. Issue analysis	X	X	X			X	X
E. Examples of analyzed issues	X	X	X			X	X
F. Applying issue analysis skills	X	X	X			X	X
II. Identifying Issues and Preparing Research Questions							
A. Identifying environ. issues	X	X	X			X	X
B. Identifying variables assoc. with environmental issues	X		X				
C. Writing research questions	X		X		X		
III. Using Secondary Sources							
A. Secondary sources of issue-related information					X		
B. Processing information from secondary sources			X		X		
C. Reporting secondary source information					X		
IV. Using Primary Sources							
A. Surveys, questionnaires, and opinionnaires	X		X		X		

Key: SC = Science; HE = Health; SS = Social Studies; MA = Math; LA = Language Arts; HO = Home Economics; AG = Agriculture

Outline Topic	SC	HE	SS	MA	LA	HO	AG

Key: SC = Science; HE = Health; SS = Social Studies; MA = Math; LA = Language Arts; HO = Home Economics; AG = Agriculture

IV.							
B. The interview					X		
C. Selecting the population	X		X	X			
D. Procedures of sampling	X		X	X			
E. Data collection strategies	X		X				
F. Developing and using instruments/interviews	X	X	X		X	X	X
V. Interpreting Data from Environmental Issue Investigations							
A. Organizing data in data tables	X		X	X			
B. Communicating data by graphing	X		X	X			
C. Interpreting data	X		X		X		
D. Applying data interpreting skills to issue-related data sets	X	X	X			X	X
VI. The Independent Investigation of a Student-Selected Environmental Issue							
A. Selecting an issue . . .	X	X	X		X	X	X
B. Writing research questions	X	X	X		X	X	X
C. Collecting secondary information			X		X		
D. Collecting primary information	X	X	X	X	X	X	X
E. Issue analysis/data interpretation	X		X	X	X		
F. Communication of results					X		
VII. Issue Resolution: Skills and Application							
A. Citizenship responses to issues and their effects	X	X	X			X	X
B. Principles of citizenship action			X				
C. Methods of citizenship action			X			X	X
D. Individual vs Group Action		X	X			X	X
E. Guidelines for decision-making	X	X	X			X	X
F. Applying issue resolution skills	X	X	X		X	X	X

Infusion Possibilities for:
Environmental Issue Investigation and Action Skills

The Skill	Science	Soc. St.	Research	L. Arts
Sampling	X	X	X	
Comparing Info. Sources		X		X
Problem Identification	X		X	
Issue Analysis	X	X		
Classification	X	X		
Synthesis		X	X	
Evaluation	X	X		X
Communication (Written)	X	X	X	X
Communication (Oral)	X	X	X	X
Comparison	X	X		
Summarizing Information		X		X
Values Clarification		X		
Writing Research Questions	X	X	X	X
Writing Survey Instruments	X	X	X	
Data Collection	X	X	X	
Data Recording	X	X	X	
Graphing	X	X	X	
Data Interpretation	X	X	X	
Citizenship Action Skills				
Consumerism		X		
Political Action		X		
Persuasion		X		X
Ecomanagement	X	X		
Action Analysis/Evaluation	X	X		

From these tables, one may infer several things about the process of planning for infusion. First, like Hungerford, Ramsey and Volk, environmental education planners must be prepared to develop, in some detail, outlines for the content and skills which should be addressed in given courses. One may begin with a careful listing of environmental contents and skills, or one may begin with such a listing for other subject area courses (e.g., biology or history). Broad course objectives are rarely specific enough to permit the careful analysis required to determine the potential for infusion. On the other hand, when available, performance objectives (see Part I) should be more than adequately suited for this type of analysis.

Second, infusion planning will often require a team approach, since no one professional can be an expert in environmental education and several other subject areas. It is advisable that environmental education planners should be knowledgeable about at least one of the subject areas being considered for infusion. Other subject areas under consideration may be represented by specialists from those areas who are familiar with environmental education and with infusion. Finally, the infusion process cannot be completed without the cooperation of middle level administrators, curriculum supervisors, and most importantly, teachers. These are the people who can make or break infusion efforts where they count most; i.e., in the classroom. For this reason, it also is advisable to involve key middle level school personnel early in the infusion planning process.

Infusion into Teacher Education Programme Courses

Basically, the same principles which apply to infusion at the middle level also apply to infusion at the TEP level. Assuming for the moment that the reader wishes to infuse environmental content, skills and methods into an existing middle level TEP, the process may begin with the identification of the desirable environmental content, skills and methods to be offered. Decisions may be then be made (or imposed) about which types of courses these contents, skills and methods might "fit." For example, one option would be to pursue a total TEP infusion approach (see Hungerford, Volk, Dixon, et al., 1988), while another could be to use a partial TEP infusion approach, such as the one used in this document. The existing course are then reviewed for the extent to which the desired contents, skills, and/or methods are already being taught, as well as for the extent to which they could be taught there. The results of such analyses should enable TEP planners to decide how to proceed with subsequent steps. The details of planning for infusion from this point are far beyond the scope of this document, as they are likely to be programme specific. Nonetheless, the end result of infusion planning should be a plan for how all important environmental contents, skills, and methods will be offered through existing and/or new TEP courses.

The next page contains a brief analysis of the potential for infusing various EE methods (i.e., which are discussed in Part IV of this document) into other special methods courses. These are emphasized here since methods are unique to infusion at the TEP level.

Infusion Possibilities for:
Selected Environmental Education Methods

Goal Level	Methods	SC	SS	LA	MA
Key: SC = Science; SS = Social Studies; LA = Language Arts; MA = Math					
I. Ecological Foundations					
	Field Studies	x			x
	Simulations/Models	x			x
	Film Viewing/Discussion	x			
II. Conceptual Awareness					
	Field Trips	x	x		
	Simulations/Models	x	x		
	Basic Case Studies	x	x		
III. Investigation/Evaluation of Issues					
	Secondary Source Analysis		x	x	
	Primary Data Collection	x	x	x	x
	Issue Analysis	x	x	x	
	Panel Discussions/Debates	x	x	x	
IV. Environmental Action Skill					
	Skill Training Session	x	x		
	Action Workshop	x	x		
	Action Analysis	x	x		
	Student Action Projects	x	x		

As a whole, TEP/SEE infusion planning will often need to take into consideration general studies, specialized content, special methods, and other education courses. For this reason, TEP/SEE infusion planning may become a complex undertaking. As with middle level infusion planning, key administrators and faculty responsible for offering such courses should be involved early in the planning process, for they will ultimately play important roles in the litmus tests of infusion: "How well is it working?", and "How well prepared are our teachers?". They will also be responsible for seeing that course descriptions and syllabi are revised, and new materials selected (or developed) for use in the "infused" portions of each course. Despite the extensive effort involved, the teacher preparation payoffs can be very high for an undertaking like this. Preservice candidates should emerge from such a TEP/SEE prepared to work in environmental, science and social studies classrooms, to incorporate information/perspectives from any of these areas into their instruction, and to make use of a wide variety of instructional methods.

The Recommended TEP Specialization in Environmental Education

Based upon the previous discussions, the authors have developed a TEP/SEE which consists of 13 courses, covering 48 hours of coursework. In addition, three courses

which could be used to support and extend the TEP/SEE have been briefly outlined to provide readers with further insight into the inclusion and articulation of TEP courses within an overall TEP/SEE.

The basic design of this TEP Specialization is presented on the following page. As implied in the previous discussion, there are two useful ways of viewing the distribution of the 48 credit hours within this Specialization in Environmental Education. First, one may view it from the standpoint of traditional content and methods courses. In this case, the Specialization consists of 36 credit hours of content coursework, including three courses in the environmental, science, and social science content areas. It also consists of 12 hours of methods coursework, including two environmental education courses, and a methods course in science and in social studies education. It is important to recognize that there are limitations associated with a strict content/methods breakdown, for ideally, environmental content will be included in methods courses, and content courses should include initial or extended exposure to (e.g., modeling of) environmental education methods used by the methods faculty.

A second way of viewing the distribution of these 48 credit hours is from the standpoint of "Core" courses in the Specialization, and courses into which environmental content, skills and/or methods will be "Infused". In this case, there are five (5) core environmental courses for a total of 18 hours, as well as eight (8) disciplinary courses selected for their infusion potential. These eight courses cover 30 hours of coursework. In this case, all of these "Infused" courses are either science or social science courses. While this breakdown is also a useful one, it too is limited, since at least two of the Core environmental content courses are predominantly environmental science content courses.

Given some of the limitations involved in fragmenting this TEP/SEE, it is more appropriate to view the courses within this Specialization as a whole. Only in this context does the Specialization adequately address each of the premises and suggested guidelines. It appears to balance coverage of goal-related content and methods coursework. It also appears adequate to prepare teachers to offer environmental education coursework as separate (interdisciplinary) environmental education courses AND as infused components of science and/or social studies courses. At least in theory, this Specialization is capable of developing competent environmental educators capable of adjusting to fit the limitations and opportunities of the educational setting in which they teach. In many nations, this flexibility should serve as an asset in the planning and delivery of environmental education within middle level school programmes.

Given the variety of programmes involved in the preparation of middle level teachers (McEwin & Allen, 1982; 1988), the authors have attempted to organize the coursework in this Specialization so that it could be easily adapted (or modified) to fit the various programmes. For example, middle level TEPs which require a double major, or a combination of a major and a minor should find this combination of science and social studies content and methods courses amenable for their use. In addition, those programmes which emphasize three or more concentrations could possibly seek to offer the environmental courses as a third academic concentration. The fit of this TEP/SEE seems most difficult or strained for those TEPs which require only a single area of academic concentration. Still, readers should note that an attempt has been made to select science and social science courses often required as part of undergraduate general studies requirements. Thus, if a single area TEP program requires extensive general studies coursework in science and social science, it still may be possible to offer a slightly modified version of this TEP/SEE. In any event, readers are encouraged to adapt this design to their middle level TEP, certification, and schooling conditions.

COURSES COMPRISING THE SPECIALIZATION IN ENVIRONMENTAL EDUCATION

CONTENT COURSES

CORE COURSES		INFUSION COURSES	
		SCIENCE	
Ecology	4 Hrs.	Geology for Teachers	4 Hrs.
Environmental Science	4 Hrs.	Atmospheric & Ocean Sciences	4 Hrs.
Environmental Health	4 Hrs.	Science Processes for Teachers	4 Hrs.
*Environmental Studies	3 Hrs.	*Biological Science	3 Hrs.
		SOCIAL STUDIES	
		Studies in Geography	4 Hrs.
		Principles of Economics	4 Hrs.
		Introduction to Sociology	4 Hrs.
		* National Government	3 Hrs.
Area Content Hours	12 Hrs.		24 Hrs.

METHODS COURSES

CORE COURSES		INFUSION COURSES	
		SCIENCE	
Foundations of Environmental Education	3 Hrs.	Middle Level Science Methods	3 Hrs.
		SOCIAL STUDIES	
Methods in Environmental Education	3 Hrs.	Middle Level Social Studies Methods	3 Hrs.
Area Methods Hours	6 Hrs.		6 Hrs.

* NOTE: The three courses marked with an asterisk (*) are three additional courses which could be used to support and extend, but which have not been included in the TEP/SEE. Since these are additional courses, they are listed here, but are not included in tallies of either the number of courses or the number of course hours comprising the TEP/SEE.

Description of Core Courses within the Specialization

Below and on the following pages, readers will find descriptions of each of the six "Core" courses within the TEP/SEE. While the authors present rather detailed descriptions of each course, they have attempted to leave sufficient room for readers to adapt (or tailor) the course to fit their environmental and/or educational circumstances. Thus, the authors encourage readers to respect the intentions of the outlined courses AND to make such modifications as they see fit.

These course outlines generally do not include either citations for particular reference and curricular materials, or enabling activities (i.e., with the exception of the Foundations course). In many cases, materials which might have been cited may not be available to readers. Similarly, materials and activities which work in one part of the world will not necessarily work elsewhere. Nonetheless, readers interested in reviewing available materials or activities which reflect these courses are referred to subsequent portions of this document, as well as to Unesco documents by Hungerford, Volk, et al. (1988), and Hungerford, Ramsey and Volk (1989).

Finally, readers will no doubt notice that the "recommended course content" component of content course outlines naturally tend to be content focused, and give minimal attention to what were termed learner "operations" in Part I (e.g., "analyze ...", "investigate ...", "evaluate ...", "clarify ...", and so on). On the other hand, the sets of "goals to be facilitated" and "sample learner objectives" for these courses provide some general indications of the kinds of operations learners should be engaged in with respect to the contents outlined. Thus, as readers begin to consider and plan classroom activities for preservice teachers, they should be mindful of not treating the "recommended course content" component as a lecture/ discussion outline. Rather, activities should reflect the contents outlined and the operations reflected in identified goals and objectives. Consequently, course design and development will be a necessary and important activity for readers interested in designing TEP/SEE courses such as these.

Ecology (4 Hrs.)

The general ecology course is designed to provide preservice teachers with a broad conceptual introduction to the major areas of study in the science of ecology. Typically, ecology courses are offered to secondary science majors, particularly those majoring in biology. While it is possible that such an ecology course might fit the TEP/SEE, readers are encouraged to carefully consider the degree to which that type of course is appropriate for the preservice middle level teacher. There are several points to consider. First, the person(s) responsible for establishing and teaching the ecology course should always keep in mind that the students who are enrolled will NOT become professional biologists/ecologists, but instead will be teaching general education concepts to middle level adolescents. Second, the ecology course should be activity oriented, making extensive use of various classroom, lab and field activities. The use of activities with teachers should help them become comfortable with the content of ecology, as well as with the use of an activity-oriented instructional approach. Finally, if and when possible, activities should be planned which permit preservice teachers to adapt those activities for use in their own classrooms. Seldom does one see this latter point attended to in secondary science major ecology courses. Yet, if this approach is taken, it would eventually impact upon a sizeable number of middle level students in a positive manner.

Recommended Course Content: Ecology as a Science: What is ecology? **Units of Organization of Life in Ecology:** individuals, species populations, biological communities, ecosystems, and biomes. **Individuals and Species Populations:** definitions of individual, species, and population; intra-species interactions, social behavior, cooperation, and competition; mortality and natality; age classes and age structure; fertility and reproductive potential; population growth rates; cyclical and eruptive populations. **Species Populations and Their Environments:** adaptation, tolerance ranges, and limiting factors; habitat and home range; emigration and immigration; density and distribution; carrying capacity; population regulation via density dependent and density independent factors. **Biological Communities:** community defined and illustrated; species diversity and dominance; microcommunities and macrocommunities; species interactions and dynamics, inter-specific competition, predation, parasitism, mutualism and commensalism. **Energy in Communities and Ecosystems:** energy sources, transfers, and thermodynamics; primary production and its efficiency; food chains and food webs; energy flow, trophic levels, and energy pyramids; energy efficiency and community energy budgets. **Ecosystems:** local and regional ecosystems; ecosystem structure, layering, and zonation; biotic and abiotic variables; material cycling and biogeochemical cycles; niche defined; generalized and specialized niches. **Biomes:** definition and illustration of biomes based on vegetation types; role of climate; the "biosphere" and "ecosphere" concepts. **Succession:** definition and illustration of primary succession, and of secondary succession; characteristics and comparison of early and late successional stages in local/regional ecosystems; homeostasis. **Humans as Ecological Factors:** uses of, competition with, and influences on species populations; alteration of habitats and communities; endangered species; modification of energy, food, and material patterns in ecosystems; modification of biogeochemical cycles; human population dynamics and resource use; preservation of species, habitats, communities, and ecosystems.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

1. ... communicate and apply - in an educational setting - major ecological concepts including those which focus on individuals and species populations; communities and ecosystems; biogeochemical cycles; energy production, storage, transfer and degradation; interdependence; niche; adaptation; succession; homeostasis; and humans as an ecological variable.

2. ... apply knowledge of ecological concepts to the analysis of environmental problems and issues, and be able to identify important ecological principles involved.

Sample Learner Objectives: Subsequent to the completion of this ecology course, the preservice teacher should be able to ...

1. ... identify those units (or levels) of organization of life within the life sciences which are of interest to ecologists.

2. ... provide descriptions of cyclical and eruptive populations which clearly distinguish between the two. Further, provide a minimum of one (1) example of each type which illustrate those descriptions.

3. ... predict what is likely to happen to a habitat and a population when that population exceeds its carrying capacity.

4. ... identify and describe the potential regulatory effects of three (3) density-dependent factors on population size.

5. ... provide definitions and examples which clearly illustrate two of the following types of symbioses: parasitism, commensalism, and mutualism.

6. ... identify a minimum of four (4) variables which influence the relative efficiency of primary production in terrestrial (or aquatic) communities.

7. ... describe the relationship between vegetation type, ecosystem type, and biome.

8. ... present three (3) examples of the ways in which humans modify energy, food and/or material patterns in ecosystems, and describe the effects of each on ecosystems.

NOTE: For additional learner objectives associated with this course, the reader is referred to the presentation of sample objectives in Part I, and to the "Ecosystem Observation Activity" in Part IV in this document. The reader is also referred to Chapter III in Hungerford, Ramsey, and Volk (1989).

Environmental Science (4 Hrs.)

In the preparation of middle level teachers in environmental education, environmental science is one of the most basic content courses offered, and so, is seen as central to the TEP/SEE. In addition, such a course has great value as a general studies course, making it as appropriate for most collegiate undergraduates as it is for preservice teachers. By its very nature, it is highly interdisciplinary, integrating content from the various areas of natural and social sciences.

The content of an environmental science course should probably be weighted toward issues which are of great importance, both regionally and internationally. It is very important for the preservice teacher to develop a holistic view of the environment from a problems and issues perspective. If this is not accomplished, the classroom teacher may be more likely to focus on problems and issues which have only local interest and local importance without helping adolescents understand the trans-boundary, international, and global dimensions of the numerous environmental crises facing humankind.

In addition, there should be some explicit attempt to review proposed and actual solutions to the issues addressed in the course. Unfortunately, this does not appear to be a common practice in courses of this type. There is some evidence to indicate that failure to address solutions may contribute to feelings of despair and helplessness on the part of undergraduate students (Sivek, 1982). These are certainly not the kinds of predispositions which should be engendered by coursework in the TEP/SEE. For this reason, readers are encouraged to see that the topic of solutions is integrated into the fabric of this course, and not left till the last segment of the course.

It appears to be extremely important for preservice teachers enrolling in the environmental science course to have completed a course in ecology as a prerequisite. Doing so should guarantee that the preservice teachers come to environmental science with a reservoir of ecological concepts at their disposal. These concepts are, of course, foundational to a thorough understanding of environmental issues.

Recommended Course Content: **A Brief Review of Critical Ecological Concepts and an Introduction to Their Use in Understanding Environmental Problems and Issues. The Global Nature of Environmental Problems:** descriptions of what is meant by global, international, and trans-boundary; an introductory overview of critical global issues including: human population growth, land use management, world hunger, fisheries and wildlife management, tropical rain forest loss, pollution, global warming and ozone depletion. **Population:** population dynamics and growth trends; relationships between population, resource use, technology, pollution, and health; the concept of and conditions contributing to sustainable national and global populations; trends in human population control; variables conflicting with population control; critical issues to be resolved. **Land Use Management:** trends in land use policies and land use patterns in developed and developing countries; urban growth and urban sprawl trends; zoning regulations, variances and enforcement; land uses and land reclamation policies (e.g., strip mining or landfill reclamation); multiple use planning; planning for parks, greenbelts, wildlife refuges, and wilderness; the relationships between population and land use management. **World Hunger:** the relationships between food supplies and world hunger; benefits from and problems associated with various agricultural systems; potential benefits from plant genetics and gene banks; pressures to cultivate additional land and to increase yields; problems associated with pesticide production, export, and usage; the critical nature of and factors influencing soil erosion; pressures on and limits to sustainable fisheries. **Fisheries and Wildlife Management:** the ecological role (niche) and benefits of terrestrial and aquatic wildlife; habitat destruction and endangered species; the need to preserve biological diversity and gene pools; over-utilization and extinction of species; introduced species, feral animals and pariahs; protection and management of game and non-game species; competing and multiple uses; regional issues associated with fisheries/wild-life management. **The Tropical Rain Forests:** global distribution of tropical rain and tropical dry forests; the rain and dry forests as species habitats; species inventories and species extinction; benefits of and products from rain forests; patterns of rain forest uses and destruction; economics of alternative development and preservation strategies; management problems and initiatives for resolving them. **Pollution:** types of air, water, and land pollution; population, urbanization and pollution problems; sources and effects of air borne pollutants; acid precipitation; sources and effects of freshwater pollution; groundwater pollution; solid waste disposal and ocean dumping; effects of toxic wastes; regional issues associated with air/water/land pollution. **Ozone Depletion and Global Warming:** causes and extent of ozone depletion; potential effects of ozone loss; trends in the combustion of fossil and organic fuels; trends in atmospheric CO_2 and temperature fluctuations; erosion of the global buffering capacity; potential effects of global warming; associated regional issues. **The Contribution of National and International Political, Scientific, Environmental, and Educational Bodies to the Recognition, Understanding and Resolution of these Issues:** identification of bodies and organizations; types of action strategies; trends in their policies, strategies, and efforts; a review of impacts, barriers/limitations, needs and priorities.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

2. ... apply knowledge of ecological concepts to the analysis of environmental problems and issues, and be able to identify important relevant ecological principles.

3. ... apply a knowledge of ecological concepts in predicting the probable ecological consequences of alternative solutions to environmental problems.

5. ... understand and communicate how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from an ecological perspective.

6. ... understand and communicate how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

7. ... identify a wide variety of local, regional, national, international, and global environmental issues, as well as the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues, as well as the ecological and cultural implications of these various solutions.

18.... demonstrate the ability to design action plans using citizenship action strategies associated with each of the following categories of strategies: consumer action, physical action (eco-management), persuasion, political action, and legal action.

Sample Learner Objectives: Subsequent to the completion of this environmental science course, the preservice teacher should be able to ...

1. ... describe the major ecological and cultural implications of any four (4) environmental issues of global scope and significance.

2. ... describe the potential ecological implications of introducing genetically altered food-producing plants into areas where those plants are not naturally occurring for intensive agricultural purposes.

3. ... describe specific examples of the impact that feral horse and burro populations have had on western U.S. ecosystems. [A similar objective can be used to evaluate students' knowledge of the impacts any feral population has had/is having on existing ecosystems.]

4. ... describe how the relationship between biotic and abiotic conditions in tropical rain forests can be used to predict potential bio-physical consequences of alternative human uses of rain forested areas (e.g., of rubber farming, slash-and-burn agriculture, cattle grazing).

5. ... describe three (3) major ecological consequences associated with the intensive use of coal as a source of energy and as a source of pollution. [Again, a similar objective can be used to evaluate students' knowledge of consequences associated with the use of other types of commonly used energy resources, such as wood or oil.]

6. ... identify three (3) international bodies involved in the remediation of a given environmental issue. In addition, identify the alternative approaches to resolving that issue advocated by each, and the apparent ecological and cultural implications of those approaches.

7. ... based upon an assessment of need, work with other students to design a plan of action which could be used for resolving a selected environmental issue. [This plan should feature use of one or more eco-management, persuasion, political, and/or legal action strategies.]

Environmental Health (4 Hrs.)

The course in environmental health is designed to serve as an introductory overview to the field of environmental health. Interested readers are encouraged to seek out national organizations such as the National Environmental Health Association (U.S.: 720 S. Colorado Boulevard, South Tower, #970; Denver, CO 80222) for assistance in the development of courses in this area.

This introductory course is intended to complement the environmental science course, which focuses more upon the ecological dimensions of environmental issues than upon the human and public health dimensions of those issues. Nonetheless, the authors feel that both the ecology and the environmental science course should serve as prerequisites to environmental health. Collectively, those courses should provide preservice teachers with a solid understanding of important scientific dimensions of environmental issues. This kind of background should prepare preservice teachers to more easily identify and understand environmental health problems and issues.

Since this is only an introductory course, the authors recognize that it can only serve as an introduction to the biological dimensions of environmental health (e.g., the ecology of pathogens, physiological responses to pathogens). For this reason, the authors recognize that a biology course might be designed and used to supplement this environmental course, and so, have included a biology course as a supplement to the TEP/SEE. A brief outline of topics relevant to this course, and to other courses in the TEP/SEE has been included in a later section of Part III. In any event, readers are encouraged to provide opportunities within the TEP for preservice teachers to complete adequate coursework in biology, preferably prior to enrolling in the environmental health course.

As with the environmental science course, the content of an environmental health course should probably be weighted toward issues which are of importance, both regionally and internationally. It is very important for the preservice teacher to develop a broad view of environment health problems and issues. On the other hand, since environmental health issues are likely to be of serious local import, classroom teachers should be prepared to help students analyze and investigate such issues (or local manifestations of broader issues). For the same reasons discussed with respect to the environmental science course, there also should be some explicit attempt to review proposed and actual solutions to the issues addressed in this course. Thus, readers are encouraged to see that the topic of solutions is integrated into the fabric of this course as well.

Recommended Course Content: **Introduction to Environmental Health:** a field concerned with epidemiology, occupational health and safety, and personal health behavior; **An Introductory Overview of Critical Environmental Health Issues (including those surrounding):** food production and distribution; water, air, and noise pollution; solid waste management; exposure to heavy metals; toxic waste management; radiation and nuclear waste management; an overview of environmental monitoring, epidemiological investigation, and access to biomedical support systems. **Food Production and Distribution:** food production for consumption and export; uses of and exposure to pesticides in agricultural settings; monitoring and regulation of pesticides; the export, import and use of banned pesticides; safe use and disposal practices; maternal, infant, and child malnutrition; long term biological, epidemiological, and societal dimensions of malnutrition; international marketing of food supplements; population, agricultural resource development, and food aid; regional food issues related to health. **Water Pollution:** sources and uses of water in personal, agricultural,

and industrial settings; sources and types of surface and groundwater pollution; detection, monitoring, and regulation of point and non-point sources; human diseases traceable to water pollution, including diseases: borne by microorganisms, and resulting from exposure to introduced organic and inorganic substances; movement of pollutants/carriers in physical systems and in food chains; wastewater and sewage treatment strategies for households and communities; watershed management. **Air Pollution:** sources and types of air pollution in rural and urban settings; detection, monitoring, and regulation of point and non-point sources; permanent and episodic sources of indoor air pollution; impacts of air pollution on health including the incidence of respiratory disease, circulatory problems and disease, and cancer; long range effects of air pollution (ozone depletion and global warming) on human health; strategies for reducing air pollutants. **Noise Pollution:** sources and levels of noise in the environment; biological, psychological and behavioral effects of noise on human beings; the monitoring and regulation of noise levels. **Solid Waste Management:** sources and types of solid waste, including agricultural, mining, industrial, and municipal (individual/community) wastes; sources and types of municipal waste; methods of municipal solid waste disposal; disposal of and methods for treating agricultural, mining and industrial waste; ecological and health effects of improper solid waste disposal techniques; detection, monitoring and regulation of solid waste disposal; methods for reducing solid waste; regional and local issues surrounding solid waste disposal. **Exposure to Heavy Metals:** identification of heavy metals and their occurrence in the environment; short and long term biological effects of ingestion; sources of heavy metals found in air, water, food, and housing; monitoring, regulation, and reduction of heavy metals in the environment. **Toxic Waste Management:** identification of types of hazardous/toxic waste; point and non-point sources of toxic waste in the environment; trends in toxic waste disposal and treatment; exposure of humans to toxic compounds; biomedical effects of exposure; monitoring, regulation, and proper treatment of toxic compounds. **Radiation and Nuclear Waste**: sources of low and high level radiation in the environment; levels of background and introduced radiation; half-life of radioactive materials; occupational exposure to radiation; short and long-term storage of low and high level nuclear waste; biomedical effects of exposure to low and high level radiation; monitoring, regulation, and enforcement of exposure; regional issues associated with radiation and nuclear waste.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

2. ... apply knowledge of ecological concepts to the analysis of environmental problems and issues, and to identify important ecological principles involved.

3. ... apply a knowledge of ecological concepts in predicting the probable ecological consequences of alternative solutions to environmental problems.

5. ... understand and communicate how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from an ecological perspective.

6. ... understand and communicate how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

7. ... identify a wide variety of local, regional, national, international, and global environmental issues, as well as the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues, as well as the ecological and cultural implications of these various solutions.

10.... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

11.... understand and communicate the need for responsible citizenship action in the solution of environmental issues.

Sample Learner Objectives: Subsequent to the completion of this environmental health course, the preservice teacher should be able to ...

1. ... identify two (2) organic and two (2) inorganic compounds which can be ingested through foodstuffs and which contribute to human health problems. Further, trace the pathway(s) of each compound through the food chain.

2. ... describe the potential ecological consequences associated with each of three (3) alternatives for treating and/or disposing of toxic waste.

3. ... describe three (3) ways in which discrete human activities contribute to the accumulation and/or disposal of solid waste in their region. Further, describe the ecological and human health effects of each.

4. ... identify and describe four (4) ways in which individuals commonly contribute to "noise pollution". Further, describe the potential human health effects of each (i.e., on humans regularly exposed to each).

5. ... describe three (3) alternative solutions for the long term storage of high level nuclear waste. Further, assess the potential ecological, health, economic, and political implications of each.

6. ... identify the underlying values and beliefs associated with each of four (4) positions an individual might take in response to international requests for aid to a starving population. Through discussion, clarify one's personal values with respect to the human and ecological implications of each position.

7. ... identify five (5) discrete environmental issues of regional importance which hold important implications for human/public health.

8. ... identify three (3) reasons one might offer in defending the position that individuals must assume responsibility for the safe disposal of pesticides (or other potentially toxic compounds) in their home and/or work environments.

Foundations of Environmental Education (3 Hrs.)

Since this TEP/SEE is designed to prepare preservice candidates to teach in the area of environmental education, it is most appropriate that they receive an introduction to the field. This course is designed to serve as an introduction to the field of environmental education on a national and an international basis. While the national portion of this course

will vary from country to country, the authors have developed an outline of topics which represent several key aspects of national efforts in environmental education. In an attempt to clarify their outline, the authors have elected to use U.S. experiences as examples. Since this is a unique course, the authors have also included references to potential course materials to further clarify their intentions to interested readers. At the same time, the international portion of the course emphasizes relatively common elements of international environmental education, and so, should serve as an adequate example for most countries. Nonetheless, it is clearly recognized that readers should certainly adjust the content, and perhaps even the outline of this course to fit the record of environmental education in their nations.

Since this course is an introduction to the field, it should provide preservice teachers with an overview of several important topics which serve as prerequisites to the environmental education methods course. The course should most certainly include a historical view of the roles and efforts of governmental offices, colleges and universities, K-12 schools, non-formal educational programmes, and where appropriate, conservation/ environmental organizations in the support and delivery of EE. It should also include a review of the definition(s), guidelines, mission, aims and goals of EE which have received prominent attention by these various sectors within the particular nation. Finally, it should include a review of the various types of print, audio-visual, field, and community resources which are available to teachers to utilize in the development and delivery of EE programmes. While experiences in these areas will vary from nation to nation, and will therefore lead to differences in emphasis across these topics, readers should make every effort to address these topics in this course. It is the authors' intention that teachers should clearly recognize the character of the interdisciplinary field in which they are preparing to teach. In time, this should enhance the quality of their service as informed professionals in the field.

Some of the material highlighted in this methods course is addressed in Part IV of this document. Readers are referred ahead to the pertinent sections of Part IV if they seek clarification of topics which are only presented in outline form below. They are also referred to other Unesco documents which address these and related aspect of teacher preparation (see Wilke, Hungerford, & Peyton, 1980).

Recommended Course Content: **National Roots of Environmental Education:** contributions within the U.S., including the development of nature study (NS), outdoor education (OE), conservation education (CE), and natural resource education (e.g., Stapp 1974; Kirk, 1977; Swan, 1884); in the 1950s and 60s, the development of ecology as a science, the recognition of the environmental consequences of human activity, the development of techniques for measuring such impacts, and the recognition of the finitude of the biosphere (e.g., Osborne, 1953; Cole, 1958; Odum, 1959; Carson, 1962; Stevenson, 1965; Ward, 1966; U.S. Department of the Interior, 1967); the National Environmental Education Act of 1970 (e.g., Morrissett & Wiley, 1971; Brezina & Overmeyer, 1974; Albrecht, 1984) and the introduction of (The Journal of) Environmental Education (Schoenfeld, 1971). **International Roots of and Structures for EE:** early international conservation efforts; the creation of Unesco, IUCN (1948), World Wildlife Fund (1961), and other international bodies; United Nations sponsored/international conferences on environmental matters in the 1960s and 1970s (e.g., Caldwell, 1972); the development of UNEP, the Unesco Office of EE, and the Unesco-UNEP Programme (Stapp, 1976, 1979; Stapp, et al., 1979; Unesco-UNEP, quarterly); an assessment of international needs/priorities in EE, the Belgrade Workshop and Charter, Regional Meetings, and the Tbilisi Conference (Aldrich, et al., 1976; Unesco, 1977a, 1977b, 1978; Unesco-UNEP, quarterly). **Development of a National Infrastructure for Environmental Education**: definition of and key components of an educa-

tional infrastructure; historical contributions from NS, OE, and CE to the development of park interpretive programmes, youth organizations and youth camping programmes, resident outdoor programmes and outdoor laboratories, nature and environmental centers, K-12 school programmes and school study sites, university programmes, and professional education organizations (e.g., Funderburk, 1948; Lively & Preiss, 1957; Stapp, 1965; Hammerman & Hammerman, 1973; Saveland, 1976); contributions of public media, organizational programmes and publications (e.g., Audubon, National Wildlife Federation); the rise of environmental studies (e.g., Schoenfeld & Disinger, 1978; Harde, 1984; Disinger & Schoenfeld, 1987) and environmental education in colleges and universities (e.g., Bowman & Disinger, 1980); state coordination of and teacher education guidelines in EE (e.g., Disinger & Bosquet, 1982; Wilke, 1985); trends in cooperative educational ventures (e.g., university/school and school/non-formal cooperation); the development of a National EE Network; renewed consideration of a National Environmental Education Act to support and advance the national infrastructure. **International and National Definitions of Environmental Education**: differences between EE and ecology, NS, OE, and CE (e.g., Schoenfeld, 1969; Tanner, 1974; Hungerford, 1975); early definitions and definitional problems (e.g., Stapp, et al., 1969; Disinger, 1983); structure, guiding principles, and key characteristics of EE (e.g., Harvey, 1976; Unesco, 1978; Hart, 1981; Hungerford, Peyton, & Wilke, 1983); mission, aims, goals and objectives of EE (e.g., Unesco, 1978; Hungerford, Peyton, & Wilke, 1980). **EE Resources and Curricular Materials:** types of available resource materials; inventorying local/regional field and community resources; availability and educational quality of audio-visual materials including filmstrips, videos and films, programs disseminated through television, and computer software; types of curricular materials, including textbooks, modular programmes, supplementary materials such as activity manuals, case studies, trade books, and other print activities/materials on ecology/ environment topics; overview of curriculum research, development and implementation strategies; evaluation of the potential educational uses and benefits of resources and curricular materials. **Current International and National Concerns in EE**: apparent needs, unresolved problems/issues in theory and practice, and avenues or opportunities for addressing these.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

21.... demonstrate the ability to both select and develop curricular/ instructional materials which address each of the four EE goal levels, and which are appropriate for use in middle level settings.

Sample Learner Objectives: Subsequent to the completion of this environmental education course, the preservice teacher should be able to ...

1. ... identify the differing types of criteria teachers might use in evaluating and making decisions about the use of curricular materials [These might include goal emphasis, training required, teacher usability, student readability, student appeal, accuracy of information, opportunity for student skill development/inquiry, cost, and so on.]

2. ... evaluate sets of curricular materials which are widely available to teachers for the materials' coverage of recognized EE goals and objectives.

3. ... evaluate sets of curricular material which are widely available to teachers against selected middle level implementation criteria.

4. ... discuss the implications of the results of an evaluation of curricular materials for the selection and use of materials in their programme (or classroom).

5. ... conduct an inventory of local field and community resources which could be used instructionally to address EE goals and objectives.

6. ... identify local field and community resources which might be included/ addressed in a local EE curriculum development effort.

7. ... identify appropriate regional/local EE-related professionals with whom teachers could work in the development and field-testing of EE curricular materials.

Methods in Environmental Education (3 Hrs.)

The course in environmental education is designed to serve as an introduction to theory and practice in the design and delivery of EE instruction. This course begins with an introduction to several basic tools used in organizing and preparing for instruction in EE: (a) EE goals and objectives; (b) the General Teaching Model; (c) the characteristics of local middle level EE programmes; (d) goal-related methods and resources generally available to teachers; and (e) the rudiments of lesson plan design. With these in place, the preservice candidate should be prepared to move through four goal-related instructional cycles. Each of those cycles should include a review of tools used in organizing instruction, exposure to actual middle level classroom instruction, and practice in the design of instructional activities (i.e., for use with students) and lesson plans (i.e., for teachers' use). These cycles build toward the practice teaching of those lessons in laboratory settings (micro-teaching), and later, toward the delivery of refined lessons in actual classroom settings. It is crucial to provide preservice teachers with actual field experiences (i.e., observation and practice teaching) in middle level settings prior to student teaching. Under such circumstances, preservice teachers must be prepared to collect evaluative data, to solicit and accept feedback, to critically reflect upon their instruction, and to revise their instruction on those bases. While this may be psychologically difficult for some at the outset, in the long run it should prepare them to improve their instruction on an autonomous basis.

Much of the material highlighted in this methods course is addressed in Part IV of this document. Readers are referred ahead to the pertinent sections of Part IV if they seek clarification of topics which are only presented in outline form below.

Recommended Course Content: **An Overview of the General Teaching Model and Its Application. A Review of Goals and Objectives in Environmental Education. An Overview of Methods and Resources Used in Teaching for EE Goals and Objectives. Planning for EE at the Middle Level:** an overview of common (regional) middle level EE-related programmes, programme goals, courses, and course components (e.g., use of school sites, field trips, camping programmes); comparison between middle level EE programme features and available methods/resources; relationships between middle level curriculum and instruction in EE; an introduction to designing middle level curricula and instruction to address EE goals. **The Basics of Lesson Plan Design:** including attention to objectives, teacher preparation, delivery activities, and student evaluation. **Addressing Environmental Sensitivity:** a review of the nature and development of environmental sensitivity; aspects of sensitivity which can be addressed in educational programmes; methods and resources for attending to sensitivity; addressing sensitivity through instruction focused

upon other goals. **Design and Delivery of Ecology Instruction:** instructional models; available materials and resources; classroom methods and strategies; evaluating learning outcomes; observing and analyzing ecology instruction; designing activities and lesson plans in ecology. **Design and Delivery of Issue-Focused Instruction:** teaching for issue awareness and for issue-related skill development; cultivating students' sense of empowerment, investment, and ownership with respect to issues; a review of skills used in analyzing, investigating and evaluating issues; basic and extended case study approaches for organizing issue instruction; the skill development approach to organizing issue instruction; available materials and resources for issue instruction; classroom methods and strategies; evaluating learning outcomes; observing and analyzing issue instruction; designing activities and lesson plans for issue awareness and skill development. **Design and Delivery of Environmental Action Skill Instruction:** a review of environmental action strategies and skills; a review of opportunities for and barriers to instruction in action strategies/skills; available materials and resources for action strategy/skill instruction; classroom methods and field-based experiences for strategy/skill development; opportunities for students to apply action strategies/skills; evaluating learning outcomes; observing and analyzing action strategy/skill instruction; designing activities and lesson plans for action strategy/skill development. **Implementing and Evaluating EE Instruction:** observing (or video-taping) students' micro-teaching of lessons in the areas of ecology, issues, and action skills; review and discussion of micro-teaching by instructor, student, and/or class; modification of activity design, lesson design and/or classroom delivery by students; implementation of modified EE lessons in middle level setting; evaluation of middle level students; obtaining feedback from cooperating teacher(s) and middle level students; students' critically reflect upon their activities, lessons and classroom delivery.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

22.... demonstrate the ability to organize and implement instruction at each of the four EE goal levels using those teaching strategies which have proven effective, and which are appropriate for use in middle school settings.

23.... demonstrate the ability to design and carry out appropriate assessments of student learning at each of the four EE goal levels in middle school settings.

24.... demonstrate the ability and a willingness to modify one's selection of instructional materials and/or strategies based upon the results of classroom evaluations and assessments.

Sample Learner Objectives: Subsequent to the completion of this environmental education course, the preservice teacher should be able to ...

1. ... organize an extended case study (for a particular environmental issue), which includes activities addressing all four goal levels (or levels of issue instruction).

2. ... assess the appropriateness of a set of extended case study activities for use at the middle level (or in a particular middle level programme).

3. ... design an activity which provides students with the opportunity to practice using issue analysis skills, and design a full lesson plan around that activity (i.e., including an evaluation strategy).

4. ... successfully implement an evaluation strategy he or she has designed to assess student learning outcomes associated with one or more skill development lessons which had been taught to middle level students.

5. ... openly discuss (with the cooperating middle level teacher and/or with the course instructor) the apparent strengths and weaknesses of a particular lesson which she or he has designed and taught to middle level students .

6. ... identify the aspect(s) of their instruction which could be modified in order to improve instruction based upon middle level student evaluation data and other student feedback.

Description of Infusion Courses within the Specialization

Below and on the following pages, readers will find descriptions of each of the eight "Infusion" courses within the TEP/SEE. While the authors present rather detailed descriptions of each course, they have attempted again to leave sufficient room for readers to adapt (or tailor) the course to fit their environmental and/or educational circumstances. Thus, the authors encourage readers to respect the intentions of the outlined courses AND to make such modifications as they see fit. For the same reasons cited with respect to "Core" courses, these course outlines generally do not include citations for particular reference and curricular materials, or for enabling activities. Readers who are interested in reviewing available materials or activities which reflect these courses are referred to subsequent portions of this document, as well as to the Unesco document prepared by Hungerford, Volk, et al. (1988).

Geology for Teachers (3 Hrs.)

This course is designed to provide preservice teachers with an introduction to geology (physical geography) as one of the earth sciences. In this light, the course should serve as an overview of topics in geology, as well as an introduction to the interdisciplinary character of the earth sciences. In addition, since this course is part of the TEP/SEE, it also serves as an infusion course, and so, reflects a particular emphasis upon environmental geology topics. The interdisciplinary treatment of earth science phenomena should provide valuable insights into various dimensions of environmental topics.

The content organization of this course must therefore be adapted to fit the TEP/SEE, while the methods used in the course should be appropriate for middle level teachers. Thus, the course begins with more of a traditional geology and earth science emphasis. Later portions of the course are organized with environmental themes in mind, though these sections should contain sufficient background material drawn from geology and related earth sciences, as some scientific background is deemed necessary for identifying and interpreting geology-related environmental issues. With respect to methods, students should be provided with direct experiences associated with geology, earth science, and environmental topics to as great an extent as possible. The authors recognize that this is an ideal course in which to include field trips, the use of community resources, and laboratory exercises. Instructors should also be encouraged to make use of, and therefore expose preservice teachers to appropriate EE goal-related methods.

Readers will no doubt recognize that this course does not look like a traditional introductory college geology course. They are reminded that the course should be designed to reflect the interdisciplinary and environmental dimensions of geology topics, and to meet

the needs of preservice teachers (i.e., not treat the teachers as budding scientists). The instructor(s) of such a course must clearly recognize these intentions, and attend to them in a professional manner. Under these circumstances, instructors should be provided with the support required to design and offer this type of course, and with opportunities to discuss these matters with other faculty holding related responsibilities within the TEP/SEE.

Recommended Course Content: **Geology as a Science. The Earth as a Physical Body:** the structure of the earth's interior, sub-surface and surface features; the earth a dynamic body, and the theory of plate tectonics; the composition and motion of plates. **Surface Evidence of a Dynamic Earth:** an introduction to geological landforms and geological processes; the relationships between process, structure and stage; an overview of tectonic activity at plate boundaries; landforms associated with sub-surface heating and volcanism; landforms associated with folding and plate collisions; landforms associated with fault zones; manifestations and human/environmental impacts of volcanic, folding and faulting activities. **Geology and the Earth Sciences:** an overview of the earth sciences, with emphasis on geology, meteorology and climatology, hydrology and oceanography; examples of interdisciplinary contributions to understanding geologic processes (e.g., erosion and weathering) and structures; landforms associated with the work of running water (e.g., drainage basins, deltas), wind, waves and current action; landforms associated with the work of solutions; landforms associated with mass wastage (e.g., landslides, landflows, subsidence), and with glaciation. **Natural Resources:** types of natural resources and their uses; geological, ecological, and human perspectives on natural resources; the concepts of non/renewable, non/sustainable, and non/biodegradable. **Surface and Ground Water:** sources and supplies of surface waters; surface runoff, overland flow, and stream flow; processes/causes, rates, and consequences of natural and accelerated overland erosion; stream load, transportation, and siltation; stream erosion and control; impacts of modifications of stream flow using channelization, locks and dams; groundwater, water tables, and aquifers; rates of infiltration, discharge and recharge; human uses of aquifers; aquifer depletion and pollution; saltwater infiltration. **Soils:** the soil as a dynamic body; soil formation, composition and classification by biome; human uses of and environmental impacts upon soil, including agricultural practices and soil erosion, effects of temperate and tropical deforestation on soil and soil erosion, effects of strip mining and strip mine reclamation, and development and land use planning. **Mineral Resources:** types, properties, and uses of metallic and nonmetallic minerals; the relative abundance and distribution of major minerals; resources vs. reserves; access to deposits, human demand, and rates of use; policies regarding rights to and development of "commons" reserves; release into and disposal in the environment; strategies for resource conservation, substitutability, and recovery. **Energy Resources:** overview of energy sources and resources; overview of fossil fuels, their origins, occurrence; regional issues associated with petroleum, coal, nuclear, geothermal and other energy resources. **Petroleum:** the composition and "fractioning" of petroleum; petroleum reserves, human demand, and use; "Hubbard's Hump"; uses of petrol products in agriculture, transportation, textiles and plastics; environmental effects of oil transportation, including ocean going vessels and spills, pipeline construction and leaks; the environmental effects of combustion, including particulate, CO and NOX emissions; petroleum conservation, substitutes, and product reclamation. **Coal:** the composition, classification, and distribution of coal; coal reserves, demand, and uses; effects of sub-surface and strip mining on human health and the environment; effects of coal use on human health and the environment, including particulate and SOX emissions. **Nuclear:** overview of uranium and other resources used in the nuclear industry; occurrence, reserves, and demand; military and civilian uses; human and environmental effects of mining, milling, enrichment and fabrication processes (e.g., for U235 and U238); effects of exposure to low level and high level radiation; alternatives for and issues associated with the short and long term storage

of high and low level nuclear waste. **Geothermal:** sources, locations, and uses; dry and wet steam generation. **Resource Responsibilities:** the roles and responsibilities of international and national bodies, citizens' organizations and individual citizens in resource conservation; development of sustainable national, regional and global resource conservation and management plans.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

1. ... communicate and apply - in an educational setting - major ecological concepts including those which focus on individuals and species populations; communities and ecosystems; biogeochemical cycles; energy production, storage, transfer and degradation; interdependence; niche; adaptation; succession; homeostasis; and humans as an ecological variable.

2. ... apply knowledge of ecological concepts to the analysis of environmental problems and issues, and be able to identify important ecological principles involved.

3. ... apply a knowledge of ecological concepts in predicting the probable ecological consequences of alternative solutions to environmental problems.

4. ... understand principles of ecology in order to identify, select and utilize appropriate sources of information in a continuing effort to investigate, evaluate and develop solutions for environmental problems.

5. ... understand and communicate how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from an ecological perspective.

6. ... understand and communicate how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

7. ... identify a wide variety of local, regional, national, international, and global environmental issues, as well as the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues, as well as the ecological and cultural implications of these various solutions.

9. ... understand and communicate the need for environmental issues investigation and evaluation as prerequisites for sound decision making.

10.... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

11.... understand and communicate the need for responsible citizenship action in the solution of environmental issues.

Sample Learner Objectives: Subsequent to the completion of this geology course, the preservice teacher should be able to ...

1. ... define the following ecological concepts from the perspective of geology and the earth sciences: biogeochemical cycles; energy storage, transfer and degradation; abiotic factors; humans as an ecological variable.

2. ... identify and interpret three (3) energy-related issues from an ecological and a geological perspective.

3. ... identify and describe how three (3) discrete types of human/cultural activities in their country have influenced soil profiles. Further, describe the ecological and cultural implication associated with each.

4. ... describe four (4) ways in which individuals and societies have become dependent upon petroleum products. Further, describe the major long term ecological and cultural consequences associated with these uses of petroleum.

5. ... identify a locally or regionally important environmental issue associated with surface waters. On the basis of a library search, provide citations for eight (8) print sources individuals could go to if they were to investigate the ecological dimension(s) of that issue.

6. ... identify three (3) alternatives solutions for the long term storage or disposal of high level nuclear waste. Further, discuss the requirements and limitations associated with each from a geologic and economic standpoint.

7. ... describe the positions taken by scientists, government officials, agricultural industry representatives, and natural resource interest groups on the depletion of deep fossil water aquifers. Further, discuss each position in terms of available scientific evidence and apparent value perspectives.

8. ... describe the unique roles and potential contributions of international bodies, national bodies, citizens organizations, and individual citizens to the resolution of mineral resource conservation issues.

Atmospheric and Ocean Sciences (3 Hrs.)

This course is designed to provide preservice teachers with an introductory overview of atmospheric and ocean science as two disciplines within the earth sciences. Since this course features two disciplines, it will emphasize important topics in each, as well as the interdisciplinary character of the earth sciences. And, as with the geology course, since this course is a part of the TEP/SEE, it will serve as a course in which relevant environmental topics will be featured using infusion and interdisciplinary approaches. The content organization of this course has been adapted to fit the TEP/SEE. The course basically contains two main segments; i.e., an atmospheric segment and an ocean science segment. Topics associated with the hydrologic cycle, and climate and weather patterns are used as bridges between these two segments, primarily because of the interdisciplinary potential of these topic areas. Within the two main segments, each of the major topic areas includes relevant environmental issues, although those issues tend to be treated last. This is done so that there is adequate attention to the scientific background material deemed necessary for identifying and interpreting these issues.

With respect to methods, the methods used in the course should be appropriate for middle level teachers. In addition, students should be provided with direct experiences associated with atmospheric and ocean science, earth science, and environmental topics to as great an extent as possible. The authors recognize that this is an ideal course in which to include field experiences and trips, the use of community resources, and laboratory exercises. Instructors should also be encouraged to make use of, and therefore expose preservice teachers to appropriate EE goal-related methods.

Recommended Course Content: **An Introduction to Meteorology and Oceanography as Earth Science Disciplines. The Earth and Its Atmosphere:** views and evidence regarding the development of earth's atmosphere; present day structure (layers) and composition (gasses) of the atmosphere; impacts of contemporary human activities on the structure and composition of the atmosphere, including ozone depletion and carbon dioxide increases. **Solar, Planetary, and Atmospheric Energy Patterns:** effects of positioning of the earth, latitude, cloud cover, elevation, aspect and surface coloration on surface energy gain; planetary energy gains and energy transfers between land/atmosphere and ocean/atmosphere; the accumulation and dissipation of heat by the planet and within the atmosphere; the contributions of human activity to planetary energy gains and global warming. **Atmospheric Motion:** an overview of global atmospheric and wind movements; primary forces affecting motion, including the Coriolis effect, pressure and surface temperature differences, and friction between land/ocean surfaces and the atmosphere; formation of cold and warm air masses; prevailing wind and pressure patterns, air mass movement and fronts; types of storms and weather patterns. **The Hydrological Cycle:** an overview of the abundance and distribution of water (i.e., ocean, land, and atmosphere); an overview of the hydrologic cycle; surface temperature and water evaporation; atmospheric particles, cloud formation, and condensation; gravity, temperature and forms of precipitation; a review of surface and ground water movements; relationships of and effects of removal of plants to surface temperature, evaporation (transpiration), and precipitation; human impacts on the hydrologic cycle including the increase of atmospheric particles, cloud seeding, and changes in evaporation patterns; acid precipitation. **Climate and Weather Patterns:** climate and weather defined; the effects of solar radiation, atmospheric movements, the hydrologic cycle, topography and altitude, and ocean currents on climate; macro and micro-climates; local weather patterns. **The Ocean as a Physical Environment:** distribution of continents and oceans, including continental shelves and slopes, and ocean basins; a review of plate tectonics and oceanic evidence; the birth and death of oceans; tectonic influences on the topography of the ocean floor, including ridges, faults, volcanos, and mountain ranges; mining on the ocean floor; the effects of specified variables on ocean levels, layering, currents, tides and wave motions (e.g., climate changes, solar radiation, water temperature, Coriolis effect, gravitational force of sun and moon, wind); energy from temperature gradients, currents, and tidal motion. **Oceans as a Chemical Medium:** the sea as a dynamic chemical medium; concentrations of "salt" and other minerals in ocean and estuarine waters; mineral extraction from sea water; biogeochemical cycles, gasses in sea water, and the presence of life (e.g., O_2, CO_2, N); use hydrogen and deuterium as energy resources; other requirements for plant and animal life in the ocean. **The Oceans as a Habitat for Life:** a review of the effects of physical and chemical conditions on lifeforms; latitude and zonation: the effects of light, temperature and depth on the presence and adaptation of lifeforms; primary production across zones; the occurrence of animal phyla in oceans; social behavior among ocean lifeforms; ocean food chains, webs and energy flow; causes and effects of human harvesting of ocean species; disruption of food chains and reproductive patterns; protection of species through international treaties and national policies. **Ocean Pollution:** causes, types and effects of physical and chemical pollution (e.g., oil, solid waste,

toxics, nuclear waste, medical waste); identifying and evaluating alternative or proposed solutions to issues.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

2. ... apply knowledge of ecological concepts to the analysis of environmental problems and issues, and be able to identify important ecological principles involved.

3. ... apply a knowledge of ecological concepts in predicting the probable ecological consequences of alternative solutions to environmental problems.

4. ... understand principles of ecology in order to identify, select and utilize appropriate sources of information in a continuing effort to investigate, evaluate and develop solutions for environmental problems.

5. ... understand and communicate how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from an ecological perspective.

6. ... understand and communicate how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

7. ... identify a wide variety of local, regional, national, international, and global environmental issues, as well as the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues, as well as the ecological and cultural implications of these various solutions.

9. ... understand and communicate the need for environmental issues investigation and evaluation as prerequisites for sound decision making.

10.... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

11.... understand and communicate the need for responsible citizenship action in the solution of environmental issues.

Sample Learner Objectives: Subsequent to the completion of this earth science course, the preservice teacher should be able to ...

1. ... identify two (2) examples where humans have placed pressures upon ocean species through overfishing, and describe the potential (or apparent) ecological consequences for doing so in each case.

2. ... describe the potential effects of dumping solid waste into offshore waters on local marine ecosystems and fisheries.

3. ... identify a regional environmental issue which reflects human modifications to or impacts upon the hydrologic cycle. On the basis of a library search, select and provide cita-

tions for four (4) print sources they would use if they were to investigate the ecological dimension(s) of alternative solutions to that issue.

4. ... describe the apparent short and long-term environmental effects associated with the increasing uses of fossil fuels for home, transportation, agricultural and industrial purposes.

5. ... identify several significant, global environmental issues associated with human impacts on the atmosphere and/or the ocean.

6. ... communicate the need for an investigation of possible contributing causes, potential solutions, and projected consequences of global warming as a prerequisite for making informed decisions about this issue.

7. ... identify four (4) groups which take differing positions on the issue of off-shore drilling for oil, and analyze both the stated positions and the apparent rationales associated with each position. Further, subsequent to such an analysis, s/he will identify and explain the positions they take on this issue.

8. ... communicate primary reasons for reducing emissions which contribute to air pollution (e.g., particulates, ozone, sulfur oxides or SOX, and nitrous oxides or NOX), from political (e.g., U.S. and Canadian relations), human health, and ecological perspectives.

9. ... communicate the need for citizens, corporate interests, and governmental offices/agencies to take action in reducing chlorofluorocarbons (CFCs) and other compounds which contribute to the destruction of the ozone layer.

Science Processes for Teachers (3 Hrs.)

With a growing awareness of the need for, and with a growing emphasis upon science processes and upon issue investigation skills in middle level programmes, the authors see this as a crucial course in the training of middle level teachers. This course attempts to do several things: (1) it introduces the student to the science-technology-society (STS) relationships; (2) it provides indepth training in both the basic and integrated science process skills; (3) it provides training in issue investigation skills; and (4) it demands the application of both sets of skills by the preservice teacher.

Recommended Course Content: **The Nature of Science:** emphasis upon the relationship between scientific inquiry (process) and knowledge (product). **The Philosophical Basis of Empiricism. Rationales for and Purposes of Instruction in Science Processes. Modern Instructional Goals for Science:** an overview of Project Synthesis; goal clusters for science instruction including: meeting personal needs, coping with science-related societal issues, academic preparation, and awareness of careers in science. **Science Process Skill Instruction:** the basic science process skills defined, modelled, and applied (i.e., observing, comparing, inferring, classifying, measuring, and predicting); the integrated science process skills defined, modelled, and applied (i.e., operationally defining variables, hypothesizing, designing experiments, conducting experiments and controlling variables, recording and interpreting data). **Issue Investigation Skill Instruction:** the nature of science-related issues; issues associated with problems and with solutions; the skills needed for effective issue analysis and investigation defined, modelled, and applied (i.e., identifying issues; analyz-

ing issues to identify the parties at issue, positions they take, and beliefs and values they espouse; writing research questions; using skills associated with data collection via secondary sources; using skills associated with data collection via surveys, questionnaires, and opinionnaires; recording data, interpreting data, and drawing conclusions). **Investigating Issues:** the autonomous investigation of a science-related societal issue (e.g., an environmental issue), reporting of an issue investigation to peers.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

4. ... understand principles of ecology in order to identify, select and utilize appropriate sources of information in a continuing effort to investigate, evaluate and develop solutions for environmental problems.

9. ... understand and communicate the need for environmental issues investigation and evaluation as prerequisites for sound decision making.

10.... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

11.... understand and communicate the need for responsible citizenship action in the solution of environmental issues.

12.... apply the knowledge and skills needed to identify and investigate environmental issues (using both primary and secondary sources of information), and to synthesize the data gathered.

13.... demonstrate the ability to analyze environmental issues, and the associated value perspectives for their ecological and cultural implications.

14.... demonstrate the ability to identify alternative solutions for important environmental issues, and the value perspectives associated with those issues.

15.... demonstrate the ability to evaluate alternative solutions and associated value perspectives for their ecological and cultural implications.

19.... demonstrate the ability to evaluate specific (selected) action strategies in light of their ecological and cultural implications.

Sample Learner Objectives: Subsequent to the completion of this science process course, the preservice teacher should be able to ...

1. ... demonstrate the ability to selectively identify and utilize print information (secondary) sources while engaged in the investigation of an ecologically-related environmental issue.

2. ... demonstrate the ability to thoroughly analyze an environmental issue, and identify and communicate: (a) the issue under scrutiny, (b) the "players", (c) the players' stated position(s), (d) the players' espoused beliefs or rationales for taking that position, and (e) the players' values.

3. ... demonstrate the ability to autonomously investigate a science-related societal issue, and expertly communicate the complexities of that issue to others.

4. ... communicate the alternative solutions available for resolving an environmental issue as well as the value perspectives associated with those solutions.

5. ... communicate the ecological and cultural implications of the alternative solutions proposed for science-related societal issues. [While students will certainly be able to do so for the issue they investigate, they should also be able to do so for other issues investigated and reported on by class members.]

6. ... demonstrate the ability to design and administer a valid questionnaire or opinionnaire to appropriate sample populations.

Middle Level Science Methods (3 Hrs.)

Prior to this course, the preservice teacher should have completed the ecology, geology and ocean/atmospheric science courses, the science process course, and the environmental education foundations and methods courses. In this methods course, students will be utilize foundational knowledge in these areas of science and environmental education in developing their skills to plan, implement and evaluate science activities for the middle level classroom.

This course provides a general introduction to resources and materials, teaching strategies, and options available to teachers of science at the middle level. The theme which pervades this course is "education for scientific literacy" as operationalized by current goals for science education. A portion of this course is lab-oriented, with preservice teachers experiencing science activities which can be used with adolescents. In addition, preservice teachers should be exposed to local community and field resources for science education. Further, they should be exposed to various types of activity-oriented print materials, and alternatives for adapting those materials to differing programme and course conditions (e.g., traditional science courses, infusion courses, and interdisciplinary/team taught courses). They will be trained to critically analyze and supplement textbooks and other curricular materials with respect to their usefulness in developing scientific literacy and environmental literacy.

One of the most important course features is that students will be provided with opportunities to observe and deliver science instruction in middle level settings. This portion of the course will usually necessitate the following: (a) the identification of skilled science teachers whose practice generally reflects the scientific literacy thrust of this course; (b) the establishment of a professional working relationship with the school, administrator(s), and cooperating teachers; and (c) the development of clear expectations for the preservice teacher, and for the supervision of the preservice teacher. Since school placements are such an important part of this course, the instructor(s) should work carefully toward establishing these conditions. Although the establishment of good school placements may require extensive time and effort, the payoffs for preservice teachers should be immeasurable.

Recommended Course Content: **The Nature of Science:** a review of the nature of empiricism; the relationships between inquiry (process) and knowledge (product) in science; scientific attitudes associated with empiricism, inquiry and scientific knowl-

edge; relationships and differences between science and technology. **Aims and Goals of Science Education:** science education with a general education perspective; the definition and components of scientific literacy; goals for scientific literacy: Project Synthesis; the relationship between literacy variables and the Project Synthesis goal clusters; analysis of national, state, and/or school goals for attention to scientific literacy variables and goals; relationship of goals to student self-esteem, social interactions, and self-directed learning. **An Overview of Planning for Science Instruction:** a review of the General Teaching Model; an analysis of the various programme, course and teaching arrangements for middle level science, including traditional, infusion, and interdisciplinary/ teaming course strategies; a review of alternative unit and lesson plan designs; drafting performance objectives. **Teaching for Scientific Knowledge:** types of scientific knowledge; inductive and deductive approaches for teaching and learning science concepts; concept models and strategies including those drawn from the work of Bruner, Karplus, Piaget, Novak and Ausubel; teaching facts, laws and theories from a conceptual perspective; the observation and analysis of content-oriented science instruction; designing concept learning activities, evaluations, and lesson plans. **Teaching for Scientific Inquiry:** a review of basic process skills (i.e., observing, comparing, inferring, classifying, measuring, and predicting); class, lab and field methods for teaching basic process skills; a review of integrated science process skills (i.e., operationally defining variables, hypothesizing, designing experiments, conducting experiments and controlling variables, recording and interpreting data); laboratory methods for teaching integrated process skills; the relationship between a skills development approach and an inquiry approach (see Schulman & Tamir, 1973); the observation and analysis of process-oriented science instruction; designing process/inquiry activities, evaluations, and lesson plans. **Teaching Science-Related Societal Issues:** an overview of the Science-Technology-Society (STS) thrust; a review of issue identification, analysis, investigation and evaluation skills; class, lab and field methods for teaching issue-related skills; the observation and analysis of STS instruction; designing STS activities, evaluations and lesson plans. **Implementing and Evaluating Science Instruction:** the observation of micro-teaching; implementing science content, process and STS lessons in middle level classrooms; evaluating instruction and student learning outcomes; modifying science instruction on the basic of data, feedback, and reflection. **Science Resources and Curricular Materials:** introduction to local community and field resources for science education (i.e., for teachers and for students); inventorying and using resources in middle level instruction; availability and educational quality of audio-visual materials including filmstrips, videos, and computer software; a review of common and available curricular materials; analyzing textbooks and other curricular materials; adapting and supplementing existing materials to accomplish the goals of scientific literacy. **Environmental Education:** a brief review of environmental literacy variables, EE goals, teaching strategies, and available resources and curricular materials; identifying opportunities and strategies for infusing EE into middle level science/STS education programmes; strategies for teacher and student teaming in issue analysis, investigation, and evaluation.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

21.... demonstrate the ability to both select and develop curricular/ instructional materials which address each of the four EE goal levels, and which are appropriate for use in middle school settings.

22.... demonstrate the ability to organize and implement instruction at each of the four EE goal levels using those teaching strategies which have proven effective, and which are appropriate for use in middle school settings.

23.... demonstrate the ability to design and carry out appropriate assessments of student learning at each of the four EE goal levels in middle school settings.

24.... demonstrate the ability and a willingness to modify one's selection of instructional materials and/or strategies based upon the results of classroom evaluations and assessments.

> NOTE: Any goal associated with the first four EE goal levels which is deemed to be compatible with the goals of Science (and STS) education also may be addressed in this course (e.g., through activities associated with the planning, implementation and evaluation of science instruction). While attention to each of the four EE goal levels should be apparent in course activities, attention to any particular goal(s) will be circumstantial. For this reason, these goals have not been included here. Nonetheless, readers are encouraged to select particular EE goals and objectives for inclusion in this course as it is modified and tailored to fit their particular TEP/SEE conditions (see Hungerford, Volk, Dixon, et al., 1988, pp. 54-56).

Sample Learner Objectives: Subsequent to the completion of the science methods course, the preservice teacher should be able to ...

1. ... identify and describe apparent relationships and commonalities amongst Project Synthesis goals, goals for STS education, and EE goals. Further, evaluate curricular materials for their attention to identified areas of commonality.

2. ... identify opportunities for infusing EE into selected science courses using content infusion and skill infusion strategies.

3. ... identify concept teaching models or strategies which could be applied in the design of lesson plans for teaching ecology and environmental science concepts.

4. ... identify science-related societal issue (or STS) teaching methods or strategies which could applied in the design of lesson plans for teaching skills used in investigating and evaluating environmental issues.

5. ... implement inquiry-oriented instructional lessons in a middle level setting which reflect selected objectives in science education, and which clearly reflect selected objectives in EE.

6. ... demonstrate a willingness to modify the design of a middle level science course such that it will accommodate infusion and/or interdisciplinary strategies for teaching EE.

7. ... demonstrate a willingness to modify the design and/or delivery of lesson plans they have prepared based upon data, feedback, and reflection.

Studies in Geography (3 Hrs.)

The geography course is designed to help preservice teachers analyze and understand the various kinds of interactions between people and their environments, whether natural, modified, or created. Consequently, emphasis will be placed upon human interactions with the environment from cultural, political, economic perspectives. The course

stands squarely in the tradition of the using the integrative character of geography to organize coursework in conservation and environmental topic areas (see Funderburk, 1948).

As a survey of the geography of human activity, emphasis can and will be placed upon current environmentally-related problems related to resources, population, regional development, urbanization, wealth, and power. Students will explore local, regional, and global environmental issues from a geographic perspective, and will suggest ways for resolving these issues. This course, therefore serves as a natural link between the study of environmental problems and responsible citizen action.

Recommended Course Content: **Geography as a Field of Study. Traditions within Geography:** studies in physical, cultural, economic and political geography; integrative studies of human-environment interactions over time and space; charting and mapping geographic phenomena; an overview of research methods in geography; current themes and trends. **Population:** general growth and distribution patterns; geographic analyses of: historical trends in population growth and density, global and national population trends, relationships between population density and population policies (i.e., both cultural and political policies), and the uses of various population control measures; implications of these trends and patterns for "spaceship earth." **Mobility and Migration:** the structure and process of human population movements; impetus for emigration and immigration, including drought/famine, human and animal food supplies, health and disease, pollution, war, and political/religious repression and tolerance; changes in human mobility; environmental implications of increasing mobility. **Language and Religion:** geographic patters in the historical development, use, transmission, and adoption/adaptation of languages; relationships among geography, mobility and multi-lingual ability; geographic patterns in the historical development, transmission and adoption/adaptation of religious beliefs and practices. **Culture and Landscape:** patterns in the development of culture and cultural geography; race and culture; cultural adaptations to and expressions in regional landscapes; historical cultural patterns associated with landscape modification and destruction (e.g., Marsh, 1864). **Health and Nutrition:** geographic analyses of: regional health crises; populations, landscapes, and the occurrence of natural hazards/disasters; the occurrence and transmission of disease (i.e., ecologically and among humans); the occurrence of malnutrition; and the distribution of health care delivery systems. **Economic Geography:** geographic occurrence of, rights to, and distribution of land, natural resources, and raw materials; the geographic impacts of the industrial revolution and industrial intensification; geographic patterns in agriculture, mining, textile, manufacturing, and other resource-related industries; the economic impact of resource geography and industrial development on population, culture and environment. **Settlement Geography and the Growth of Urbanization:** overview of human settlement patterns; rural patterns; urbanization, urban sites, and urban conditions; centrality and central place theory; geographic analyses of political, economic and social variables affecting urban populations; urban and regional planning. **Political Geography:** spatial distributions of races and cultures; geographic and historical analyses of the establishment of regional an national political boundaries; spatial manifestations of political behavior within and between nations. **Global Problems and Geographic Perspectives:** human and cultural ecology; planning and evaluating strategies for landscape, natural resource, and environmental management; world political and economic stability.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

5. ... understand and communicate how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from an ecological perspective.

6. ... understand and communicate how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

7. ... identify a wide variety of local, regional, national, international, and global environmental issues, as well as the ecological and cultural implications of these issues.

10.... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

13.... demonstrate the ability to analyze environmental issues, and the associated value perspectives for their ecological and cultural implications.

14.... demonstrate the ability to identify alternative solutions for important environmental issues, and the value perspectives associated with those issues.

15.... demonstrate the ability to evaluate alternative solutions and associated value perspectives for their ecological and cultural implications.

16.. demonstrate the ability to identify and clarify personal value positions related to important environmental issues and to their associated solutions.

18.... demonstrate the ability to design action plans using citizenship action strategies associated with each of the following categories of strategies: consumer action, physical action (eco-management), persuasion, political action, and legal action.

19.... demonstrate the ability to evaluate specific (selected) action strategies in light of their ecological and cultural implications.

Sample Learner Objectives: Subsequent to the completion of this geography course, the preservice teacher should be able to ...

1. ... analyze four (4) common cultural practices associated with land/natural resource management (e.g., agricultural, forestry, fisheries, or mining practices) with respect to their geographic scope, economic consequences, and environmental implications.

2. ... describe the long-term effects of household and regional agricultural practices on current day landscapes and on future land uses.

3. ... describe the relationship(s) that exist between those aspects of a people's language and culture associated with landscapes (e.g., terms for and practices regarding wilderness or jungle), and an their beliefs, attitudes and/or values regarding the environment.

4. ... describe the relationship between industrialization (including economic development and resource utilization), and the rise of specific environmental and/or human health issues

(e.g., resource management problems, effects of air and water pollution, nuclear waste disposal).

5. ... compare the growth of urban development with the rise of discrete environmental issues (e.g., loss of agricultural land, destruction of natural habitats and ecosystems, loss of natural resources used recreationally).

6. ... identify proposed solutions for five (5) discrete global environmental issues. Further, evaluate those proposed solutions with respect to their impacts upon cultural institutions and regional ecosystems.

7. ... identify a particular local land use issue based on an analysis of local land use patterns and of their effects upon the natural environment. Subsequently, work with other students to design a plan of action which could be used for remediating that issue. [This plan should feature use of one or more eco-management, persuasion, political, and/or legal action strategies.]

8. ... evaluate the various strategies which have been used or which have proposed for reducing population growth in their nation from both cultural and ecological perspectives.

Principles of Economics (3 Hrs.)

A basic understanding of the nature of economics and economic activity is essential to the general education of pre-service middle level teachers. These teachers should be able to relate the principles of economics to the workings and management of their country's economy. Similarly, they should be able to recognize the major influences of economic thought and activity upon environmental issues. Both macro-economic and micro-economic principles are discussed in relation to the functioning of major economic institutions and sectors of the economy. Where feasible, attempts have been made to highlight relationships between basic economic concepts and environmental quality. The macro-economic issue of economic development is treated in light of domestic and international aid, trade, and debt, as well as in the context of local and global environments.

Recommended Course Content: **Scarcity and the Economic System**: definitions of economics, economic system, and scarcity; examining the economic way of thinking about peoples' behavior in an environment of scarce resources, with emphasis upon the relationship between theory and practical observation. **Basic Micro-Economic Concepts:** organization and ownership of production; the organization of labor; the distribution of income; the roles of land, labor and capital in the economy and the marketplace; analysis of land and resource allocation, and of income distribution; economies of scale. **Micro-Economics and Environmental Issues:** economic quantification of qualitative ecological and environmental considerations; the definition of "land" from economic and ecological perspectives; differing views on land ownership and stewardship; control of scare resources; the impacts of supply and demand on dwindling or scare resources; scarcity and resource substitutability; environmental implications of marketplace determination of pricing, production, and marketing strategies; externalizing and internalizing the costs of pollution to society (e.g., health and environmental costs); granting, buying, selling and trading of pollution rights; the use of economic incentives to reduce environmental impacts and to enhance conservation efforts; environmentally-related consumer actions. **Macro-Economic Concepts**: the workings of the national economy; national economic issues, including unemployment and inflation; the relationships of

the national economy to international and global economies; international economic concerns, including exchange rates, balance of payments, balance of trade and production for export, foreign aid and debt, and foreign investment; the longer term economic issue of economic development. **Macro-Economics and Environmental Issues:** short and long-term views of quality of life and quality of environment trade-offs; environmental implications of pressures on nations to produce for export and to import banned compounds (e.g., pesticides); environmental implications of recouping costs for pollution control within the international marketplace; environmental implications of economic incentives to import waste from industrialized nations (e.g., plastics, toxics); environmental implications of foreign debt and foreign investment; inclusion of environmental criteria by foreign aid, investment, and development agencies (e.g., the World Bank); debt for conservation strategies (e.g., Madagascar); economic implications of conservation and preservation efforts; criteria and procedures for advancing sustainable development practices.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

5. ... understand and communicate how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from an ecological perspective.

6. ... understand and communicate how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

7. ... identify a wide variety of local, regional, national, international, and global environmental issues, as well as the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues, as well as the ecological and cultural implications of these various solutions.

9. ... understand and communicate the need for environmental issues investigation and evaluation as prerequisites for sound decision making.

10.... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

11.... understand and communicate the need for responsible citizenship action in the solution of environmental issues.

13.... demonstrate the ability to analyze environmental issues, and the associated value perspectives for their ecological and cultural implications.

14.... demonstrate the ability to identify alternative solutions for important environmental issues, and the value perspectives associated with those issues.

15.... demonstrate the ability to evaluate alternative solutions and associated value perspectives for their ecological and cultural implications.

16.... demonstrate the ability to identify and clarify personal value positions related to important environmental issues and to their associated solutions.

17.... demonstrate the ability to evaluate, clarify, and modify personal value positions in light of new (additional) information.

18.... demonstrate the ability to design action plans using citizenship action strategies associated with each of the following categories of strategies: consumer action, physical action (eco-management), persuasion, political action, and legal action.

19.... demonstrate the ability to evaluate specific (selected) action strategies in light of their ecological and cultural implications.

Sample Learner Objectives: Subsequent to the completion of this economics course, the preservice teacher should be able to ...

1. ... describe the effects of economic incentives or pressures on four (4) discrete types of human behavior. Further, describe how those behaviors, individually and collectively, can affect the environment.

2. ... identify four (4) cases in which economic measures have been used to enhance conservation/environmental quality; and four (4) cases in which economic measures have been used to erode conservation/environmental quality. Further, compare the two sets of cases from differing value perspectives.

3. ... cite specific economic functions of government (e.g., taxation, price stabilization, maintenance of competition, redistribution of income, management of economically important and scarce resources), and relate these to specific environmental issues. Further, provide examples of these issues, and provide governmental positions on them.

4. ... apply principles of both rural and urban economics to an analysis of economic issues, utilizing at least some of the following practices in their analysis: zoning, agricultural practices, transportation, waste disposal, and energy use.

5. ... describe why new economic ideas and practices, such as the buying, selling and trading of pollution rights may require careful investigation and evaluation as a prerequisite to environmentally sound decision making.

6. ... describe three (3) situations in which consumer actions (e.g., boycotts) can influence (or have influenced) the resolution of an environmental issue.

7. ... analyze the political, cultural, economic and environmental implications associated with the export of waste products for: (a) reprocessing, and (b) disposal (e.g., burning, treatment, burial).

8. ... identify and discuss alternative solutions to the negative effects of economic pressures associated with large foreign debts on conservation and environmental efforts.

9. ... evaluate several "debt-for-conservation" strategies in terms of their political, cultural, economic, and environmental ramifications.

10. .. identify personal behaviors which are influenced by economic forces (e.g., marketing, convenience) which result in some tangible environmental impact, and discuss their personal views on engaging (or having engaged) in those behaviors.

11. .. evaluate proposed plans for introducing economic incentives to use residential energy conserving practices and technologies from both cultural and ecological perspectives. [Such plans may arise from governmental agencies concerned with energy, from energy utilities, and/or from businesses interested in marketing their technologies.]

12. .. identify a natural resource scarcity issue (current or near future) based on an analysis of national/regional resource use patterns and the projected availability of that resource. Working in pairs, develop an action plan which aims to reduce use and enhance conservation of that resource in the region. [This plan should feature the use of, but not be limited to consumer action and eco-management strategies.]

Introduction to Sociology (3 Hrs.)

As a survey course, sociology is designed to help the preservice teacher learn about individuals (including themselves) in a social context, as well as about social institutions, conditions and problems. This introductory course acquaints the student with basic theories, major scholars, research methodologies, and the various branches and sub-fields of this discipline.

Given that this course is within the TEP/SEE, special emphasis will be given to the sociology of science, and the sociology of popular movements. With respect to the former, emphasis will be placed on an exploration of the consequences of modern scientific and technological advances. Regarding the latter, particular emphasis will be placed upon the sociological analysis and dimensions of the environmental movement. In addition, discussion will focus upon public policy, politics, and the nation's socio-cultural and economic status in relation to science/technology and environmental initiatives.

Recommended Course Content: **Sociology as a Social Science. An Overview of Major Branches and Sub-Fields, Basic Ideas and Theories in Sociology. Research Methods in Sociology:** principles of scientific analysis of sociological phenomena, attention to contemporary problems in sociology. **Basic Ideas and Concepts:** social organization, culture and society, socialization, social groups, social stratification, social movements and collective behavior, social values and norms, social pathology. **Sociology of Science:** sociological dimensions of science-related topics including scientific inquiry and research; the acceptance of new ideas within the scientific community; accumulation and transmission of scientific knowledge; applications of science to technological development; diffusion and adoption of new scientific/ technological ideas, practices and products in society; modes of social and societal adaptation to such ideas, practices and products; rates of social/societal change vs. scientific/technological change; science-related societal issues (e.g., genetic manipulation, sexually transmitted diseases, toxic waste disposal, fetal research, and so on); the relationship of science/technology to education, religion, corporate enterprise and national security. **Social Change and the Sociology of Popular Movements:** modes of social change; mass movements, public opinion, and the media; forms and uses of persuasion; change agents, opinion leaders, and communication brokers; attentive publics, the silent majority, and vocal opposition; sociology of organizations, coalitions, and networks (e.g, communication networks); causes, movements, and institutions; analysis of initiatives and their consequences. **Sociology of the Environmental Movement:** social identification of/with environmental causes; relationship between definitions of issues and levels of public support; fluctuations in public opinion and media coverage of environmental affairs, 1970-1990; in/attentive and in/active publics; events precipitating the development of con-

servation and environmental organizations; building coalitions and political agendas; institutionalization of the movement; initiating and sustaining environmental issue remediation; the relationship of the environmental movement to education, religion, corporate enterprise, political parties, and government offices. **Social Pathology:** social pathology defined; manifestations of social pathology, including crime, poverty, drug and alcohol use, and gender/sexual exploitation; the impacts of increased population densities on pathologies; changing societal views on pathologies. **Readings:** consider works by Robert Merton, Alfred North Whitehead, John Dewey, Thomas Kuhn, Albert Einstein, C. P. Snow, Gerald Holton, Everett Rogers, Riley Dunlap, and others.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

5. ... understand and communicate how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from an ecological perspective.

6. ... understand and communicate how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

7. ... identify a wide variety of local, regional, national, international, and global environmental issues, as well as the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues, as well as the ecological and cultural implications of these various solutions.

10.... understand the roles played by differing human beliefs and values in environmental issues, as well as the need for personal values clarification as an important part of environmental decision making.

11.... understand and communicate the need for responsible citizenship action in the solution of environmental issues.

13.... demonstrate the ability to analyze environmental issues, and the associated value perspectives for their ecological and cultural implications.

14.... demonstrate the ability to identify alternative solutions for important environmental issues, and the value perspectives associated with those issues.

15.... demonstrate the ability to evaluate alternative solutions and associated value perspectives for their ecological and cultural implications.

16.... demonstrate the ability to identify and clarify personal value positions related to important environmental issues and to their associated solutions.

17.... demonstrate the ability to evaluate, clarify, and modify personal value positions in light of new (additional) information.

18.... demonstrate the ability to design action plans using citizenship action strategies associated with each of the following categories of strategies: consumer action, physical action (eco-management), persuasion, political action, and legal action.

19.... demonstrate the ability to evaluate specific (selected) action strategies in light of their ecological and cultural implications.

20.... demonstrate the ability to implement action plans and apply action skills for the purpose of resolving or helping to resolve one or more environmental issues.

Sample Learner Objectives: Subsequent to the completion of this sociology course, the preservice teacher should be able to ...

1. ... describe the social forces (e.g., religious, economic, political) which may influence population growth or stability in the student's nation.

2. ... describe the manner in which individuals functioning as change agents, opinion leaders, or communication brokers can use persuasion to positively influence others' behavior toward the environment.

3. ... describe several social and political strategies which can be used by groups to positively influence the incidence of responsible environmental behavior. Further, describe the socio-cultural and ecological implications of those strategies.

4. ... describe how the salient beliefs and values of individuals/groups may lead them recognize and/or define environmental issues in differing ways.

5. ... select an environmental issue of personal concern, and prepare a written report which communicates the prominent human social activities which influence the issue, describe a possible solution to the issue, and explain how that solution is intended to impact human social institutions and/or behavior.

6. ... identify alternative strategies for communicating/diffusing practices aimed at enhancing environmental quality to various publics, and evaluate those strategies in terms of their probable socio-cultural and ecological effects.

7. ... participate in a simulation which thoroughly explores an environmental issue (e.g., human population growth, tropical rain forest destruction, international whaling quotas, Canadian - U.S. initiatives on acid rain). Prior to the simulation, the student will generate a written statement which explains her/his stand on the issue. After selecting (or being assigned) a role, the student will conduct an investigation of that issue, and assume that role during the simulation. Subsequent to the simulation and related class discussion, the student will provide a written synthesis of the alternative positions which impinge on that issue. [Note: The authors recognize that this is an activity outline which highlights several objectives, or intended learning outcomes. In some cases, it will be more appropriate to address goals and objectives from this broader perspective.]

8. ... design a plan of action for effecting desired cognitive, affective and/or behavioral change in select target groups on a particular local environmental issue using persuasion strategies.

9. ... evaluate the proposed persuasion action plan using action analysis criteria, and modify the plan on the basis of that evaluation. [These criteria should address the need for action, the potential effectiveness of the plan, conditions needed to carry out the plan, and the potential consequences for doing so].

10. .. carry out a plan of action of their own design which is intended to effect some desirable change(s) with respect to a selected environmental issue of their choosing.

Middle Level Social Studies Methods (3 Hrs.)

Prior to this course, the preservice teacher should have completed most, if not all of the TEP/SEE social studies, science and environmental content coursework. And, while the environmental education methods course also should be completed prior to this course, it may be advantageous to enroll in the science and social studies methods courses concurrently.

As should be apparent from the social studies content courses, the social studies is a broad and diverse area. Thus, students should be introduced to the variety of distinct educational purposes, traditions and approaches apparent in the social studies. In addition, students will be required to engage in many of the same kinds of activities in which they engaged in the environmental education and the science education methods courses. These include a review of the nature of the area, aims and goals, educational methods associated with several selected purposes/traditions, and activities intended to help them further develop their skills in planning, implementing, and evaluating social studies activities in middle level classrooms. As in the science methods course, the latter components may require extensive institutional and instructional planning.

Further, students should be exposed to various types of activity-oriented print materials, and alternatives for adapting those materials to differing programme and course conditions (e.g., traditional social studies courses, infusion courses, and interdisciplinary/team taught courses). They will be trained to critically analyze and supplement textbooks and curricular materials with respect to their usefulness in meeting social studies purposes and in developing environmental literacy. Finally, this course should help students develop a grasp of the concerns facing middle level social studies teachers today, particularly as these relate to matters associated with their teaching practice.

The authors have chosen to include some citations for relevant literature to exemplify their ideas. On the one hand, it would appear that the ideas presented in many (though not all) of these references would be generalizable beyond the U.S. On the other hand, readers are encouraged to adapt the emphasis and topics covered in each section to the record of and experiences in the social studies within their nation.

Recommended Course Content: **An Introduction to the Social Studies. The Status of the Social Studies:** status reports, including impressions from national studies (e.g., Shaver & Larkin, 1973; Shaver, Davis, & Helburn, 1979; Superka, Hawke, & Morrissett, 1980). **An Overview of Traditions in the Social Studies:** social studies as: social science, as citizenship education, as reflective inquiry, and as personal development (e.g., Barth & Shermis, 1970; Brubaker, Simon & Williams, 1977; Allen & McEwin, 1983). **Purposes, Aims, and Goals in the Social Studies:** an overview of guidelines and essentials in the social studies; skills emphasized in the social studies (e.g., NCSS, 1979, 1981, 1984); analysis of national, state, and/or school goals for attention to guidelines and essentials; relationship of goals to student self-esteem, social interactions and experience, and self-directed learning. **An Overview of Planning for Social Studies Instruction:** a review of the General Teaching Model; an analysis of the various programme, course and teaching arrangements for middle level social studies, including traditional, infusion, and interdisciplinary/teaming

course strategies; a review of alternative unit and lesson plan designs; drafting performance objectives. **Teaching for the Acquisition, Organization and Use of Information:** types of skills; purpose for teaching these skills; potential uses of these skills; methods and strategies for teaching these skills; the observation and analysis of skill-based instruction; designing skill development activities, evaluations and lesson plans. **Teaching Values and Issues in the Social Studies:** an overview of values and issues education; types of values and social/ societal issues; the contributions of reflective inquiry; equitable attention to divergent positions and views; development of decision-making abilities; methods and strategies used in teaching for values and issue-related competences; the observation and analysis of values and/or issue instruction; designing value and issue-oriented activities, evaluations and lesson plans. **Teaching for Citizenship:** the nature of responsible citizenship; global citizenship; competences involved in citizenship education, including those associated with values, strategies, skills, and modes of citizen participation/action; methods and strategies used in teaching for these citizenship competences; the observation and analysis of citizenship-oriented instruction; designing citizenship activities, evaluations and lesson plans. **Implementing and Evaluating Social Studies Instruction:** the observation of micro-teaching; implementing information, social issue, and citizenship-related lessons in middle level classrooms; evaluating instruction and student learning outcomes; modifying social studies instruction on the basic of data, feedback, and reflection. **Social Studies Resources and Curricular Materials:** introduction to local community resources for social studies education (i.e., for teachers and for students); inventorying and using resources in middle level instruction; availability and educational quality of audio-visual materials; a review of common and available curricular materials; analyzing textbooks and other curricular materials; adapting and supplementing existing materials to accomplish the purposes of social studies education. **Environmental Education:** a brief review of environmental literacy variables, EE goals, teaching strategies, and available resources and curricular materials; identifying opportunities and strategies for infusing EE into middle level social studies education programmes; strategies for teacher and student teaming in social studies and environmental education.

> NOTE: For the purpose of economy, an instructional cycle on teaching and learning concepts in the social studies has not been included here. Many of the ideas presented in the concept learning/teaching cycle in the science methods course would apply here equally well.

Environmental Education Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to ...

21.... demonstrate the ability to both select and develop curricular/ instructional materials which address each of the four EE goal levels, and which are appropriate for use in middle school settings.

22.... demonstrate the ability to organize and implement instruction at each of the four EE goal levels using those teaching strategies which have proven effective, and which are appropriate for use in middle school settings.

23.... demonstrate the ability to design and carry out appropriate assessments of student learning at each of the four EE goal levels in middle school settings.

24.... demonstrate the ability and a willingness to modify one's selection of instructional materials and/or strategies based upon the results of classroom evaluations and assessments.

NOTE: Any goal associated with the first four EE goal levels which is deemed to be compatible with the goals of Social Studies Education also may be addressed in this course (e.g., through activities associated with the planning, implementation and evaluation of social studies instruction). While attention to each of the four EE goal levels should be apparent in course activities, attention to any particular goal(s) will be circumstantial. For this reason, these goals have not been included here. Nonetheless, readers are encouraged to select particular EE goals for inclusion in the course as it is modified and tailored to fit their particular TEP/SEE conditions (see Hungerford, Volk, Dixon, et al., 1988, pp. 52-54).

Sample Learner Objectives: Subsequent to the completion of the social studies methods course, the preservice teacher should be able to ...

1. ... identify and describe apparent relationships and commonalities amongst social studies goals/guidelines and EE goals. Further, identify those sets of goal-related skills which the two have in common.

2. ... identify a textbook for use in a social studies classroom, and analyze the textbook for its attention to and coverage of goals in environmental education.

3. ... identify opportunities for infusing EE into selected social studies courses using content infusion and skill infusion strategies.

4. ... demonstrate a willingness to modify the design of a middle level social studies course such that it will accommodate infusion and/or interdisciplinary strategies for teaching EE.

5. ... design a case study instructional unit to illustrate how a course and/or textbook programme might be supplemented to accomplish goals and objectives common to the social studies and EE.

6. .. identify skill development teaching models or strategies which could be applied in the design of lesson plans for helping students develop information-related skills commonly emphasized in the social studies and EE. [This objective would work equally well for issue-related skills.]

7. ... identify teaching methods or strategies which could applied in the design of lesson plans for teaching for responsible citizenship participation in social and environmental issue remediation.

8. ... implement citizenship instructional lessons in a middle level setting which reflect selected objectives in social studies education, and which clearly reflect selected objectives in EE.

9. ... demonstrate a willingness to modify the design and/or delivery of lesson plans they have prepared based upon data, feedback, and reflection.

Supporting and Extending Recommended Coursework in the Specialization

Throughout the preceding description of the TEP/SEE, the authors have noted that it will be necessary to adapt the TEP/SEE, course offerings, and course content to fit the various conditions which may impinge upon the creation and structure of such a Specialization. One the one hand, the TEP/SEE has been carefully designed, and so, readers are encouraged to carefully review it in order to fully recognize its intentions. On the other, the authors clearly recognize that this TEP/SEE is but a part of a larger TEP. From this perspective, any number of other courses within the TEP could potentially be used to supplement and/or extend the proposed TEP/SEE coursework.

In laying out the TEP/SEE, the authors have identified three additional courses which could be used to supplement and extend required coursework. Those courses included one core content course (i.e., Environmental Studies), and two infusion content courses (i.e., science: Biological Science; social studies/science: National Government). Certainly these are not the only courses which might be used in this way. However, each of these courses was selected with particular TEP/SEE purposes in mind. A brief description of each course should help illustrate several features of these courses, and thereby illustrate their potential in supplementing and/or extending TEP/SEE coursework.

Environmental Studies

Since ecology, environmental science, and to a lesser degree, environmental health tend to be science oriented, this course should clearly emphasize an interdisciplinary social studies treatment of select environmental topics. The social studies disciplines featured in this course should primarily be those not featured in other TEP/SEE social studies courses. Similarly, effort should be made to include environmental topics not addressed in other courses. Having said what the course should not be, it seems appropriate to offer some suggestions as to what it could be (i.e., the organizing theme for such a course, the social studies disciplines and the environmental topics which might be featured, and the EE goals it might address).

One possible organizing theme for this course would be an historical view of the conservation and environmental movements in the nation and in the world. In many nations there might be little distinction, if any, between these two movements. In the U.S., they are not considered the same, and exhibit notable differences from philosophical, historical, issue-oriented (i.e., strict natural resource conservation and management issues vs. a broader range of ecologically and environmentally-related issues), and practical vantage points (e.g., how to approach the resolution of these issues). Thus, in the U.S., this course would emphasize the two movements, their differences and their relationships over time. Within this course, it would seem both possible and appropriate to consider strands of this history from differing social studies perspectives. These might include:

* an overview of key political figures and events in the history of these movements (e.g., the creation of Yellowstone Park, Teddy Roosevelt's land preservation efforts, NEPA);

* the development and jurisdiction of governmental resource management and environmental regulatory agencies (e.g., the Soil Conservation and Forest Service, the EPA and CEQ);

* historic decisions and initiatives by those agencies affecting the nation (e.g., creation of the National Park Service, National Forests, National Wilderness Areas, National Scenic Riverways);

* historic conflicts between conservationist and preservationist views (e.g., Gifford Pinchot vs. John Muir over Hetch Hetchy Valley in the Sierras; Glen Canyon Dam);

* important pieces of national legislation (e.g., Clean Air, Clean Water, and Endangered Species Acts), and important legal opinions (e.g., humans can "stand in" for natural objects in a court of law); and

* the evolution of ethical thinking toward the environment (e.g., from Leopold's land ethic to "deep" ecology), and the sociological dimensions of such thinking.

A careful analysis of these environmental topics should clearly indicate that each falls within the jurisdiction of the social studies. Further analysis should reveal that the topics could easily be used to address EE goals which emphasize the awareness and knowledge of environmental issues (Goal Level II), though goals associated with Goal Levels III (e.g., students conduct an investigation) and IV (e.g., instruction in the political and legislative processes available for remediating environmental issues) could also be addressed.

While the rationale of balancing science and social studies contents in core course may be important, there is no need for readers to limit this course in this way if there is reason to do otherwise. For example, in the U.S., there is an extensive literary tradition (see Brooks, 1980; and Bergon, 1980) which provides crucial insights into the conservation and environmental movements. While this might traditionally fall within the humanities, the use of such readings might provide important insights which otherwise might be missed. In making such a decision, the goals to be addressed in the course must be kept in mind. In this case, selected readings could be used to provide students with additional ecological insights (Goal Level I) which could probably not be gleaned through topics highlighted above (e.g., using writings on prairies, deserts, salt marshes, tundra). Readers are therefore encouraged to consider developing and offering a course such as this in a manner which complements other TEP/SEE courses and reflects select EE goals.

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Biological Science

Typically, biological science courses tend to place heavy emphasis upon biological classification. Although it is appropriate for preservice teachers to understand some of the rudiments of classification, readers are encouraged to carefully consider the degree to which that type of course is appropriate for the preservice middle level teacher.

If this course is used to "supplement and extend" TEP/SEE courses, this course should not be weighted in this perspective of biology. Since a course in ecology is offered as part of this TEP/SEE, it will not be necessary to address these topics in the biology course. Instead, this course should place greater emphasis upon cell biology, microbiology, botany, and human anatomy and physiology, as coverage of these topic should support and extend other science-related coursework in the TEP/SEE (e.g., environmental science and environmental health). At all times, the person(s) responsible for establishing and teaching this course should keep in mind that the students who are enrolled will not become professional biologists, but, instead, will be teaching general life science concepts to middle level adolescents. For this reason, this course should also be activity oriented, making extensive use of classroom, lab and field activities. The potential academic and affective

pay-offs for preservice teachers, and eventually, for their middle level students are such that this recommendation should not be easily dismissed.

Given this preface, topics which could be used to support and extend those emphasized in other TEP/SEE coursework include:

* The Cell as a Unit of Organization in Biology: cell theory; cellular organization; cell growth; material acquisition; metabolism and energy transfer; and cellular homeostasis;

* The Organism as a Unit of Organization in Biology: structural and functional features of organisms; material acquisition; energy transfer; internal transport and circulation; respiration; secretion and excretion; the role of a nervous system; behavior and the survival potential of behavior; and organismic homeostasis;

* Reproduction: the cellular basis of reproduction; gene theory and heredity; reproductive cycles in plants and in animals;

* The Plant Kingdom: photosynthesis and primary production; abiotic variables and terrestrial biomes; simple plants and their environments: lichens, fungi, liverworts, and algae; vascular plants; transpiration; non-flowering and flowering seed plants; pollination mechanisms; interactions among plants; plant communities; plant genetics and food production;

* Microorganisms and Parasites: agents and hosts defined; biology and life cycles of, ecology of, diseases from, biological management techniques associated with: protozoa, fungi, procaryotic organisms, strep, staph, coliform and other bacteria, viruses, flatworms and roundworms; acute and chronic diseases; adaptation and resistance to treatment; and biomedical responses to diseases and their causes; and

* Human Anatomy and Physiology: structure and functioning of human systems, including: skeletal, muscular, circulatory, respiratory, digestive, nervous, reproductive and immune systems.

A review of these should suggest how biology topics might be selected to support or extend topics in the environmental content courses. For example, an emphasis upon organisms and plants should add to the coverage of related topics in the ecology course (Goal Level I). Similarly, coverage of topics related to the plant kingdom could be used to supplement the scattered treatment of plant topics in the environmental science course (e.g., land use, hunger and food, tropical rain forests). Finally, the inclusion of microorganisms and parasites, as well as human anatomy and physiology could well serve as an introduction to related topics in the environmental health course. Topics associated with the environmental science and health courses can be used to address EE goals associated with issue awareness (Goal Level II), as well as the higher goal levels. For additional insights, interested readers are referred to the TEP biological science courses outlined by Hungerford, Volk, Dixon, et al. (1988).

National Government

A course in the nation's governmental structure is included in most TEP programmes, regardless of level. It traditionally serves as an introductory overview of the foundations and operations of the nation's political system/government, and so, this course must be adapted to reflect those circumstances. Traditional course topics would include,

but not be limited to, a review of the historical, cultural, geographic, and philosophical foundations of the political system/government, and an overview of the operations of the various branches, agencies, and/or offices.

If this course is used to supplement and extend TEP/SEE courses, it should certainly address these topics. However, particular attention should be give to those political system/governmental topics which are only tangentially covered in other TEP/SEE courses, or in an environmental studies course such as the one described in this section. Thus, it will necessary to consider this course from an infusion perspective, and carefully identify and place EE-related topics within the course outline. Depending on the type of political system/government, these topics could include:

* an historical overview of the establishment of those branches of the government responsible for conservation and/or environmental matters;

* the allocation of governmental resources, including personnel, material and financial resources to particular governmental functions, with attention to those functions responsible for conservation and/or environmental matters;

* the role(s) of political parties in the government over time, with attention to their part in shaping governmental policies, operations and initiatives related to conservation and environmental matters;

* the role(s) of individual citizens and citizens' groups in the government over time, with attention to their part in shaping governmental policies, operations and initiatives related to conservation and environmental matters (e.g., citizen participation in governmental planning);

* the political and governmental processes associated with the development and passage of legislation, particularly as these processes relate to the legislative attempts to address or remediate environmental issues; and

* the political and governmental processes associated with the enforcement of legislation, and with the regulation of individual and collective behaviour, particularly as these relate to conservation and environmental matters (e.g., responses to illegal hunting and poaching, illegal waste disposal and dumping, or exceeding of pollution standards).

A review of these topics should suggest how traditional government topics may be selected, and then supplemented in order to address important dimensions of environmental topics. This should help to clarify how this course may be used to supplement and extend coverage of those topics covered in TEP/SEE courses. For example, topics associated with the passage and enforcement of environmental legislation could be used to highlight key environmental issues (Goal Level II), and in doing so, complement topics emphasized in the required and supplemental environmental content courses. Potentially, any of the above topics could become the target of student issue investigations (Goal Level III), and thus, complement TEP/SEE courses in which Level III goals are introduced and addressed. Perhaps most importantly, these topics could also be used to address political action and legal action strategies (Goal Level IV), and in doing so complement the required TEP/SEE courses in which other types of environmental action strategies have been featured (e.g., Environmental Science: eco-management, Economics: consumer action, and Sociology: persuasion).

Suggestions Regarding the Sequencing of Courses

Throughout the previous sections of Part III, the authors have included a number of suggestions pertaining to the sequencing of courses within a TEP/SEE. While these suggestions will not be repeated, they will be organized and presented as a set of guidelines or suggestions. In addition, the authors will provide readers with some insights into some of the specific considerations used in designing the TEP/SEE courses, and particularly, the implications of them for the sequencing of courses.

General Guidelines for Sequencing TEP/SEE Courses

The guidelines presented below were used by the authors as they outlined the various courses in the TEP/SEE. These guidelines should not be new to readers, as they generally reflect traditional patterns for organizing courses within colleges and universities, and more specifically, TEP programmes. From another perspective, they generally reflect the knowledge base and common sense about the organization of courses within TEPs. Readers should not consider these as hard and fast guidelines, although they should realize that modifications in the sequence of courses will probably require modifications in the courses themselves (i.e., such that they "fit" the particular TEP/SEE structure). The guidelines used and offered are as follows:

1. For core and infusion courses, students should generally enroll in and complete required content coursework prior to enrolling in the associated methods course. Thus, the three core courses should be completed before enrolling in either the EE foundations or EE methods course. Similarly, content coursework in science and in social studies/science should be completed prior to the respective area methods course.

2. For core content courses, the ecology course should be taken first, followed by the environmental science course, and after that, by the environmental health course.

3. The science process course should be taken early in the programme so as to provide students with the skills to investigate environmental topics and issues in a large number of subsequent courses. It should be taken concurrently with a science-oriented course in which these skills might be applied.

4. It is appropriate to structure content courses such that one course from each of the three areas (i.e., environmental, science, social studies) would be taken together. Given the treatment of environmental topics in each of these courses, this would provide students with opportunities to apply what they are learning in one course to related topics in another, or, as the students might put it, to "make connections between the courses."

5. Any decisions regarding the selection of content courses from differing areas to be offered together should take into consideration two content factors: (a) commonalities or relationships between the courses' list of subject matter topics (e.g., the relationship between geology and geography, since the latter includes attention to physical geography); and (b) commonalities or relationships between the courses' coverage of environmental topics and issues. The latter is likely to be somewhat easier to work around or modify than the first.

6. Lastly, and perhaps most importantly, the coverage of EE goals within each course should be given very careful consideration when sequencing courses, and when making decisions about which courses to offer in a given semester (or quarter).

EE Goals Emphasized within Each TEP/SEE Course

Since the last guideline is deemed to be such an important one by the authors, it would appear to be appropriate to provide a chart summarizing the goal coverage of each course (i.e., as this currently appears in each course description). Such a chart should make it easier for readers to consider how the full set of TEP/SEE courses addresses the full range of goals outlined in Part I, as well as how particular goal levels - or even goals - are addressed. For the benefit of the readers, such a chart appears on the following page. Readers should consider using a chart of this sort if they decide to modify course outlines, as this type of chart can serve as a check on one's own thinking. Subsequent to this, it may also be used to consider and plan alternative course sequences using goal coverage as their guide.

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> One can envision a teacher education programme with environmental content [and skills] infused into general education courses (i.e., liberal arts courses) such as earth science, biology, chemistry, economics, social problems, music appreciation, religious history, design, basic mathematics, communications, literature, and others. The same holds true for course work specifically designed for teacher education. Environmental content [and skills] could be infused into a general classroom methods course, the student teaching experience, and special methods courses (e.g., science, math, social studies, language arts . . .). All of these courses/experien-ces have elements in them which are eminently appropriate for the . . . infusion process.
>
> Strategies for the Training of Teachers in Environmental Education. Wilke, Peyton & Hungerford, 1980

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Course Coverage of Goals for a Middle Level Preservice Specialization in Environmental Education*

	I				II							III						IV			V			
TEP/SEE Courses	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Ecology	x	x																						
Env. Science		x	x		x	x	x	x										x						
Env. Health		x	x		x	x	x	x		x	x													
Geology for Tchrs.	x	x	x	x	x	x	x	x	x	x	x													
Atmos./Ocean Science		x	x	x	x	x	x	x	x	x	x													
Sci. Proc. for Tchrs.				x					x	x	x	x	x	x	x				x					
Studies in Geography					x	x	x			x			x	x	x	x		x	x					
Prin. of Economics					x	x	x	x	x	x	x		x	x	x	x	x	x	x					
Intro. to Sociology					x	x	x	x		x	x		x	x	x	x	x	x	x	x				
Foundations of EE																					x			
Methods in EE																						x	x	x
Science Methods																					x	x	x	x
Social Studies Methods																					x	x	x	x

* NOTE: The Roman Numerals refer to the five Goal Levels of the Goals for a Middle Level Preservice Specialization in Environmental Education. The Arabic Numerals refer to specific Goals within each of the five Goal Levels. Both Goal Levels and specific Goals are fully described in Part I of this document.

One Suggested TEP/SEE Course Sequence and the Coverage of Particular EE Goals Within It

Following the "Course Coverage of Goals" chart, a second chart which portrays one particular way of sequencing the required TEP/SEE courses is presented. Certainly, this is not the only possible sequence for those TEP/SEE courses (i.e., given the current outlines of those courses). Nonetheless, it should be noted that the authors made some decisions about which EE goal levels and EE goals would be addressed within particular TEP/SEE courses while developing this sequence. Some of the more important decisions will be discussed so that readers may reflect upon specific aspects of the relationship between course design (i.e., goal coverage) and programme design (i.e., course sequencing). In addition, if readers wish to modify the course sequence provided below, they should be able to use the authors' strategy of adjusting each course's goal coverage such that that there is a well-thought-out relationship between goal coverage in courses and their placement in the TEP/ SEE course sequence. Needless to say, it is incumbent upon course designers and TEP/SEE designers to insure that careful attention is directed toward the adequate coverage of the full range of EE goals, regardless of TEP/SEE course sequence.

One Suggested Sequence for TEP/SEE Required Courses

	Course Offerings		
SEMESTER	CORE	SCIENCE	SOCIAL STUDIES
Semester "A"	Ecology	Science Processes for Teachers	-
Semester "B"	Environmental Science	Geology for Teachers	Studies in Geography
Semester "C"	Environmental Health, and Foundations of Environmental Education	Atmospheric and Ocean Sciences	Principles of Economics
Semester "D"	Methods in Environmental Education	-	Introduction to Sociology
Semester "F"	-	Middle Level Science Methods	Middle Level Social Studies Methods

Note: The letters "A", "B", "C", "D", and "E" refer only to a relative sequencing of five semesters. They do not refer to particular semesters within an overall TEP. The latter must be decided on a case by case basis within respect to each particular TEP.

In the development of course descriptions and this suggested course sequence, the authors paid particular attention to four particular EE goals. Three of these were the goals associated with Goal Level IV (i.e., goals #18, #19, and #20 in the first of the two charts). The fourth goal emphasized the application of knowledge of ecology during the issue investigation, evaluation and resolution process (i.e., goal #4). Each of these goals reflect crucial aspects of the environmental problem-solving process, and, as was pointed out earlier, tend to be neglected in many - if not most - K-12 EE programmes. Thus, the need to pay careful attention to these goals is predicated upon their relative importance and their relative neglect.

In an effort to identify and sequence courses to address goal #4, several points were considered. Since the goal emphasized ecological content, it was necessary that students either be enrolled in or have completed coursework which addressed ecological topics. In addition, since the goal addressed the application of issue investigation, evaluation and resolution skills, it was necessary that they either be enrolled in or have completed the science process course, since that it where that these skills are emphasized. These two points led to two conclusions:

a. it seemed appropriate to group the ecology and the science process skills course together; and

b. it seemed appropriate to include goal #4 in science content course which followed the these two courses, and which included some attention to ecological topics.

Since the two science content courses both included some attention to ecologically-related topics, goal #4 was included in both course outlines. It was also decided to place the two courses in back-to-back semesters, as this would maximize opportunities for students to apply both their ecological knowledge and issue-related skills.

The remaining goals fell under Goal Level IV, and emphasized the development of skills in planning (#18), evaluating (#19), and implementing (#20) responsible citizenship action strategies for the purpose of remediating environmental issues. Again several points were considered in identifying appropriate courses in which to address these goals, and in deciding how those courses might be sequenced in order to maximize student learning. Since knowledge of the five types of action strategies was a prerequisite, it was necessary to identify the course(s) in which these strategies might be taught. No one course seemed ideally suited to address all five types strategies, and, since it was deemed appropriate to address issue resolution topics in all courses emphasizing problems and issues, it appeared necessary to infuse coverage of strategies and action planning into several courses. It also appeared appropriate to sequence the selected courses so that, again, students would have the opportunity to develop and apply their skills over several semesters. Finally, since issue investigation and evaluation skills generally served as a prerequisite for action strategy instruction, the first course in which these skills could be included was the process skills course. Consideration of these points led to several conclusions. These included:

a. it was appropriate to include initial coverage of the evaluation of action strategies and plans in the process skills course, as this would naturally follow students' conduct of an issue investigation;

b. the courses best suited for addressing instruction on action strategies and action planning (#18) included the environmental science and geography courses (i.e., for a broad introduction to various strategies), economics (i.e., for consumer action strategies), and sociology (i.e., for persuasion and political action strategies). In

addition, if the supplemental national government course was to be included in the TEP/SEE, it could be used to address political and legal action strategies;

c. each of the social studies content courses emphasizing goal #18 would also do well to emphasize the evaluation of proposed action strategies or action plans (#19); and

d. the sociology course appeared to be the course best suited for the implementation of action plans (#20) given its general coverage of social change and social movements, and its particular coverage of the environmental movement and environmental issue remediation. Hence, this course should be placed later in the TEP/SEE course sequence.

These conclusions are apparent in the chart depicting course coverage of EE goals. In addition, these conclusions played a large role in guiding decisions about where to place these courses within the suggested course sequence. While there were other considerations to take into account in developing the overall sequence (e.g., content or skill prerequisites, match of course content to other courses), the above considerations weighed heavily in developing the suggested course sequence.

Summary

As readers review the material presented in Part III, they will no doubt recognize that planning a TEP/SEE is likely to involve not one, but rather a series of decisions. Initially, readers must decide whether or not they want a middle level TEP/SEE. Once they arrive at an affirmative decision, they must carefully consider those forces which may affect the development and complexion of a middle level TEP/SEE, including middle level certification and teacher education programme requirements, as well as the nature of local/regional middle level programs themselves. Once a decision has been made to develop a TEP/SEE within a particular TEP, a number of decisions must be made about the TEP/SEE general structure, including the use, number, scope and thrust of interdisciplinary environmental courses, and of disciplinary courses into which environmental content and skills might be infused. As courses are identified and course outlines developed, careful attention must be paid to the selection and sequencing of content, as well as to the coverage of EE goals within each. As course outlines or syllabi near completion, those overseeing the programme should check for coverage of EE goals across the selected TEP/SEE courses. As described in this last section, it might be necessary to modify course content and goal coverage in order to insure that adequate attention is given to each EE goal level and goal, and to provide for an educationally sound course sequence.

The material presented in Part III should serve as a sound planning guide up to this point. Beyond this point, course development (e.g., selection or development of instructional resources and materials, classroom activities), as well as TEP/SEE and course implementation, monitoring and revision will need to be undertaken with great care to insure that the intentions apparent in a TEP/SEE design can and do become realities in the preparation of middle level teachers in environmental education.

PART IV

PLANNING FOR INSTRUCTION IN ENVIRONMENTAL EDUCATION

> "The results of the study reveal a consensus among professional participants that the EE goals are important ones, that they are not being met to any large extent in existing curricula, [and] that extensive needs exist for both goal-oriented curricula and teacher education .... There is need for goal-oriented teacher education at all academic levels .... Educational efforts should focus on all four of the goal levels, and should develop in participants an understanding of the goals for EE and the knowledge and skills necessary to successfully utilize goal-oriented curricula."
>
> T. Volk, 1983

Planning for Instruction: The General Teaching Model

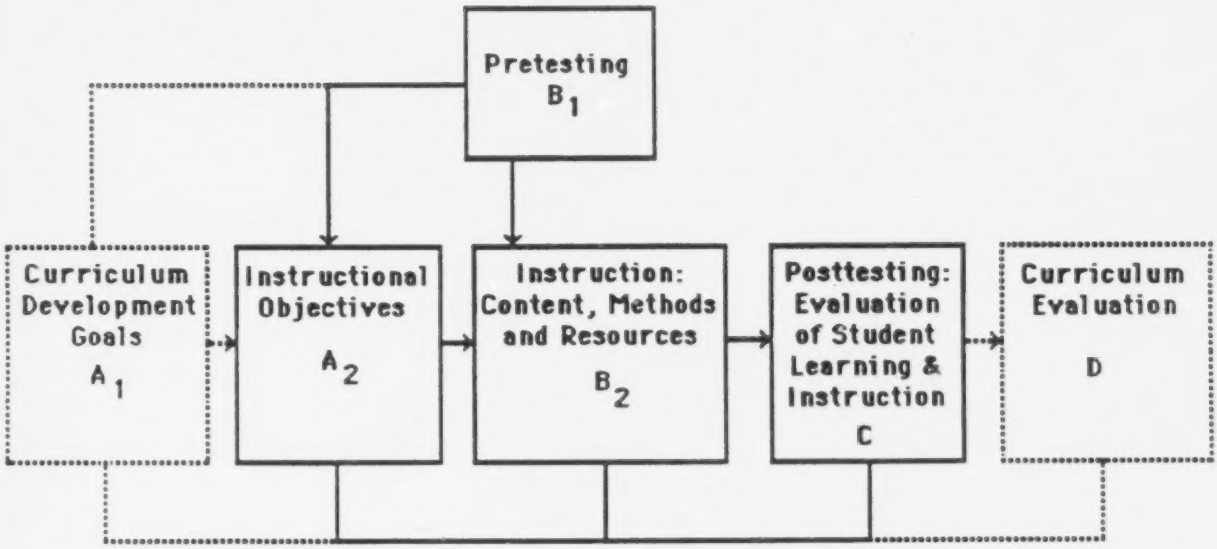
An educational model which can be used as a guide when planning for instruction is diagrammed on the following page, and is referred to as "The General Teaching Model" (Miles & Robinson, 1979; Hungerford & Peyton, 1986; Hungerford, Volk, et al., 1988). This model reflects the major components of the instructional process, as well as the role of curriculum development goals and curriculum evaluation. The latter two components are included to show how these relate to the instructional process. If and when programme and instructional planners apply this model rigorously, it can result in organized, internally consistent, and valid EE programmes/materials for any learner group. Further, it can be applied to any grade level and any content area. Of major significance is the fact that the model can be applied by any team of professional educators attempting to design separate EE courses, or to infuse EE contents into existing courses within a teacher education programme.

The curriculum development goals recommended for use in this model are the 'Goals for Curriculum Development in Environmental Education' presented in Part I of this document. These goals were divided into four goal levels: (1) Ecological Foundations, (2) Conceptual Awareness, (3) Investigation and Evaluation, and (4) Environmental Action. These goals have been validated and used for the development of curricular materials, instructional units, and research instruments. These goals also serve as the basis for this document, and so, are recommended for use in teacher education. As stated in the above quote, it is crucial that teacher education programmes adequately prepare teachers to plan for instruction (i.e., using appropriate contents, methods and resources) at each of the four goal levels.

However, regardless of the set of goals used by programme and instructional planners, a functional instructional model must be applied in order to achieve any semblance of validity in the final product. (e.g., the entire curriculum, a module, a unit or series of lessons, an activity). To generate instructional products without serious consideration to the very acts of instruction usually result in invalid, inappropriate, and inconsistent materials.

Parts A, B2 and C of this diagram constitute the heart of instruction. Pretesting (B1) should be included only when needed. Each of the major instructional components will be discussed briefly in the text which folows.

The General Teaching Model



Schematic diagram of the General Teaching Model. This diagram reflects the components of the instructional process plus original curriculum development goals and subsequent curriculum evaluation. Note the interrelatedness of all components. These relationships must be constantly respected in any curriculum development and instructional effort in order to maintain any semblance of validity. Adapted from Miles and Robinson (1979); Hungerford and Peyton (1980); Hungerford, et al (1988).

Instructional Objectives (A2)

Instructional objectives, or learner objectives, are critical to the entire process of instructional planning. This component establishes what the learner is to learn, and thus, either states or implies what the instructor is to teach.

The selection of instructional objectives should be based upon: (1) the curriculum goals being used, (2) the scope and sequence of the material to be taught (i.e., including both the contents and operations, as discussed in Part I), (3) the behaviors students are expected to (be able to) demonstrate subsequent to instruction, (4) the students' capabilities prior to or at the beginning of instruction, and (5) the various types of resources available to the instructor. As other variables are found to impinge upon the writing or the selection of objectives (e.g., national or state curriculum guidelines, standardized test specifications), readers may also wish to attend to these in the instructional planning process.

Once the instructional objectives are selected, each should be inspected for consistency with the goals being used. While there are differences of opinion as to whether all objectives can or even should be stated in performance terms, it is likely that most can be and should be in order to permit the instructor to assess learning during or subsequent to instruction. Several examples of performance objectives appropriate for the goals presented in Part I are listed below and on the next page. Additional performance objectives can be found in Part I, and in course descriptions presented in Part III.

THE GOAL LEVEL	THE INSTRUCTIONAL OBJECTIVE
Ecological Foundations	Subsequent to a series of lessons on biotic and abiotic variables, the student will visit a local, stable ecosystem and identify at least four (4) variables which contribute to the stability of that ecosystem.
Conceptual Awareness	Following a unit on the environmental implications of human cultural activities, students will be able to state three (3) examples of how regional ecosystems are threatened by human activities.
Investigation and Evaluation	After completing a lesson on how to use questionnaires and opinionnaires to collect primary data, students will be able to identify a minimum of three (3) different and issue-appropriate sample populations to whom they might administer a given set of questions (or items).
Environmental Action Skills	Upon completion of a module on environmental action strategies and skills, students will be able to state at least eight (8) criteria they would use in evaluating a proposed action plan.

The benefits of using performance-based instructional objectives are many. For example, performance-based objectives: (1) contribute to the logical sequencing of contents and operations; (2) contribute to effective communication concerning expected outcomes between instructors and their students; (3) help serve as a mechanism whereby both curriculum and instruction can be evaluated; (4) promote efficient note-taking, study habits and learning when students know what is expected of them; (5) facilitate pretesting when

this is deemed appropriate and desirable; (6) help instructors monitor student learning during the course of instruction (e.g., through assignments and quizzes covering particular objectives); and (7) help evaluators/researchers assess students' performance with respect to stated goals and objectives. The tasks of drafting, re-writing, and revising performance-based objectives is an ongoing one, and the benefits for carrying out those tasks are many.

Pretesting (B1)

Pretesting is undoubtedly of great value when an instructor is beginning to work with a new (unfamiliar) group of students, or with a new body of material to which students have had little or no exposure. When used, pretesting should involve an evaluation of the extent to which students have already mastered the performance objectives reflected in the material to be presented. Pretesting must be consistent with the stated objectives and instructional plans if it is provide the instructor with useful information for making decisions relative to such instruction (e.g., where to place greater and lesser emphasis in a particular unit). In situations where the instructor is already very familiar with the learners - or where course material has been carefully sequenced - pretesting for every unit/module may not be necessary.

Instruction: Content, Methods and Resources (B2)

This component includes both the planning and delivery of instruction. Instructional planning involves the selection and sequencing of the contents and operations emphasized in a particular set of objectives. It also involves the selection of suitable methods for teaching those contents and operations, the selection of suitable instructional resources or materials to be used, and the sequencing of activities students will engage in relative to those contents and operations. While it is crucial to plan for these aspects of instruction, well trained and well prepared instructors will inevitably modify (or make) decisions about one or another of these aspects of instruction as they are teaching. It is for this reason that planning and delivery are considered together here.

Contents emphasized in particular goals and objectives will probably differ across teacher education programmes. For example, schools surrounded by tropical rain forests should probably learn the concepts associated with "ecosystem" through visits to the forest, while those living in desert environments should learn the same concepts through explorations of their surroundings. It is foolish to ignore the student's regional biome and focus on that associated with a distant region. Similarly, the prominence of various environmental issues will vary from region to region. Those of immediate concern to the student should be used, at least initially, when planning for instruction.

"Contents" are likely to vary from region to region, it is less likely that "operations" will vary in the same way and to the same degree. At least in theory, the kinds of operations subsumed by the goals (e.g., those used in issue analysis or issue investigation using secondary sources) can be taught in a relatively consistent manner from one place to another. Nonetheless, it is recognized that cultural patterns may influence the kind of operations instructors and learners will tend to engage in, as well as the manner in which they will engage in those operations. Instructional planners, will no doubt, be sensitive to this.

Another component of instructional planning which will vary is the availability of resources for instructional and student use. Some schools will have access to a large selection of audio-visual aids and equipment, while others will not. The same is true for

library materials (e.g., secondary source material for conducting an issue investigation), laboratory equipment and facilities, community resource people, and access to regional/community resources (e.g., the representative biome). The availability of instructional resources must be kept sharply in focus when planning for instruction. This is not to say that an instructional planner should not do everything possible to overcome what appears to be a lack of available instructional resources.

Another critical component of instructional planning and delivery is method of instruction. The best available and most appropriate methods should be employed to engage students in the designated contents and operations, and in the use of available resources at each goal level. For example, laboratory activities may teach far more about an ecological principle than would a reading-and-discussion approach to it. Similarly, a field trip to an impacted area may prove more advantageous than a lecture about those impacts, particularly if the issue content is new to the learners. Further, having students prepare for their roles in a debate or a simulated hearing may provide more of an opportunity for them to clarify their values with respect to an issue than would a simple reading about the differing positions taken on that issue. The same would be true of methods which seek to actively involve middle school students in the first-hand investigation of an issue, and in working within the community to resolve an issue. Methods can make the difference between a powerful learning experience for the students and one that fails to help them acquire the knowledge, skills, and attitudes which comprise environmental literacy.

Posttesting (C)

This is probably a poor term to describe all that this includes, since it implies that evaluation will only take place upon the completion of a unit or module. Certainly, teachers can collect observations, monitor progress, and evaluate students on instructional objectives at many points in the instructional and learning process. For example, students' performance on many affective objectives can be evaluated as a function of the observation of students' behavior during classroom, laboratory or field activities (e.g., students' willingness to respect and to question differing positions during a debate or simulation, to actively explore field data/samples/observations, or to clarify their own values when discussing a proposed community action plan). In addition, there are other ways to collect observations with which to evaluate students on stated objectives during the course of instruction (e.g., through samples of student in-class, laboratory and homework, and unscheduled quizzes).

Still, students' performance on many objectives will be evaluated subsequent to instruction (e.g., on teacher made tests, on standardized tests). However, regardless of when an observations are collected and students are evaluated, the critical thing to keep in mind is to guarantee that students are evaluated in a fair manner. This means that every evaluation should reflect the stated objectives and the instruction that is actually provided. Herein lies a much too common problem in education; i.e., of preparing objectives, providing instruction, and then evaluating learners on some set of contents and/or operations other than those stated in the objectives or emphasized during instruction. Is it appropriate to include test items on content the instructor did not have sufficient time to cover in class, or to expect students to operate at the level of synthesis on a test if the ability to synthesize is not fostered by the instructor?

If performance-based objectives have been carefully prepared and clearly stated, the identification of learning outcomes and the evaluation of students may become a relatively simple matter. Of course this depends upon the means available to the instructor to measure the stated performance (e.g., objective item and essay tests, the conduct and write-up of laboratory practica, and so on). The selection of an evaluation tool or strategy will de-

pend largely on the way in which a performance-based objective is stated; i.e., the evaluation tool/strategy must measure what an objective specifies as appropriate learner behavior following instruction. For example, an objective which asks for a description of an object or event should not be evaluated via a multiple choice test instrument. Conversely, an objective that states that a student will identify the correct response from a number of responses cannot be evaluated via an essay type question. Consistency between evaluation and the other components of The General Teaching Model is critically important. Further, the instructional planner should consider how evaluation will proceed when she or he is drafting the objectives.

Oftentimes, educators infer that the evaluation process is measuring only students' successes. This is only partly true, in that posttesting is a remarkably good indicator of the suitability or effectiveness of the instruction itself, particularly if the objectives and instructional methods are sound. Posttesting can also serve as a powerful mechanism for establishing the need to revise the objectives, the instruction, or both. Certainly other indicators of student performance, indications of other desirable learning outcomes (i.e., outcomes detected which are not stated in objectives), and student feedback can provide further data for determining such needs. When revision is called for, it should be undertaken promptly and with careful planning.

An Example Activity Demonstrating the Application of The General Teaching Model

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THE ECOSYSTEM OBSERVATION ACTIVITY

Curriculum Goal: Goal Level I (The Ecological Foundations Level)
Goal 1: Communicate and apply - in an educational setting - the major ecological concepts including those focusing on individuals, species populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaptation, succession, homeostasis, and man as an ecological variable.

Instructional Objectives. Upon completion of the ecosystem observation activity, learners will be expected to be able to ...

1. ... identify the kind of ecosystem represented in/by a given natural area on the basis of field observations.

2. ... infer whether an observed ecosystem is the dominant (most typical and extensive) ecosystem in the surrounding region on the basis of field observations and prior experiences.

3. ... identify boundaries of an ecosystem on the basis of field observations, and explain why those boundaries may or may not be considered "exact".

4. ... identify a minimum of four (4) abiotic variables which appear to have a controlling effect on the ecosystem under observation, and describe the controlling effect(s) of each on the basis of field observations.

5. ... identify and cite evidence for the presence of a minimum of four (4) plant and four (4) animal species found in the ecosystem under observation (*).

6. ... identify a minimum if three (3) biotic factors which appear to have a controlling effect on the ecosystem under observation, and describe the controlling effect(s) of each on the basis of field observations.

7. ... describe how the concepts "layering" or "zonation" may apply to the spatial distribution or organization of species within the ecosystem under observation, and cite evidence for your position on the basis of field observations.

8. ... identify those species of plants and/or animals which exhibit observable intra-specific competition, and cite evidence to support each as an example of competition on the basis of field observations.

9. ... identify those species of plants and/or animals which exhibit observable inter-specific interactions, identify the specific type of interaction exhibited (competition, predation, or symbiosis), and cite evidence to support each as an example of that type of interaction on the basis of field observations.

10. ... describe how energy flows through the ecosystem under observation by identifying a minimum of four (4) energy exchanges within the system, and by citing those observations and/or inferences which support each claimed exchange.

11. ... describe the rate of change in the ecosystem under observation by predicting what this system will look like in 5, 10, 50 and 100 years, and by citing those observations and/or inferences which support each prediction.

12. ... identify any evidence of human activity in the ecosystem under observation, describe the kind and degree of impact (if any) each identified activity has upon the system on the basis of observations and/or inferences, and infer the degree of threat these impacts pose to this system.

Key Contents and Operations. Terms used for key contents (i.e., in this case concepts) and operations include:

Contents: ecosystem, dominant/dominance, abiotic, topography, insolation, humidity, biotic, species and species population, intra-specific and inter-specific, layers/layering, zones/zonation, competition, predation, symbiosis, energy and energy flow, stable/ stability, static, dynamic, impact, threat.

Operations: observing and identifying (e.g., species by name, boundaries, influential variables, evidence of impact or threat), interpreting and inferring, predicting, drawing conclusions and generalizations

To the Teacher. This activity evaluates, to a considerable extent, the ability of learners to apply select ecological concepts in a natural biological setting. It is designed for use in ecology and field biology courses and is an application and synthesis-type activity. Therefore it should follow instruction on the ecological concepts and principles emphasized. In the activity, learners are asked to respond to a series of questions which demand either direct observation or an interpretation of observations, giving the instructor an excellent perception of whether the students' concepts have been developed accurately and thoroughly. In addition, the activity provides the student with an opportunity to learn more about local ecosystems, as well as with an opportunity to synthesize information and interpret a complex biological system.

Preparation, Materials and Methods. In preparation for this activity, the teacher should decide and communicate to students how the activity will be run (e.g., in one large area during a one day field trip vs. on an independent basis by each student, etc.), and how sites will be selected for analysis (e.g., teacher vs. student selection, one vs. two students per site, etc.). It is suggested that the teacher attempt to insure that the class, as a whole, observes various kinds of ecosystems. The worksheets and any accompanying teacher assignments should be prepared, and then reviewed with students in order to clarify teacher expectations. In addition, required field study equipment should be organized such that students will have adequate access to it (e.g., seine and plankton nets, microscopes, binoculars, field guides, and so on, depending upon the kinds of systems they will be observing). Upon completion of their observations, students should be provided with the opportunity to present and compare recorded observations as part of a synthesis for the activity. Ideally, this should be done before the whole class, and there should be opportunities for discussion and questions after each presentation.

Student Materials for This Activity. The Ecosystem Observation Worksheet includes the following questions. (Students will need more space to respond than has been provided.)

The Ecosystem Observation Worksheet

To the Student. The following worksheet provides you with an opportunity to apply ecological concepts you have learned in a natural setting. Whether you are assigned a specific ecosystem in which to conduct this activity or given the option of choosing your own, you will find it necessary to carefully observe many ecological variables and use these observations in completing the tasks asked of you. Be thorough and make your observations carefully.

1. What kind of ecosystem is this? Would you call this a hardwood forest, a desert, a fresh water pond, or a grassland? Just what is it you are observing?

2. Is this ecosystem a dominant one in the region in which you live? That is, is it both extensive and typical in your region? Yes____ No____. Why did you answer as you did?

3. Are you able to identify the exact boundaries of this ecosystem? Yes____ No____. What are some of the difficulties which might be involved in identifying this system's exact boundaries?

4. What are the overall (general) characteristics of the ecosystem you are observing? Be sure to include the plants that seem to dominate this system.

5. What are the abiotic (nonliving) variables that seem to be controlling the character of this ecosystem? For example, what might be the influence of variables such as topography, bedrock, humidity, rainfall, temperature, amount of sunlight, etc. ? How do these abiotic factors, and others as well, appear to influence the overall character of this ecosystem?

6. What species populations of plants and/or animals can you observe here? What is your evidence?

7. Living organisms may be referred to as "biotic factors". Can you identify any biotic factors that seem to heavily influence the overall character of this system? Identify those that do, and explain how you think they influence this ecosystem?

8. Is there any evidence that layers or zones of life exist in this particular system? Yes____ No____. If so, how would you describe them? (If layers or zones do exist, you may wish to sketch and label them on a separate sheet of paper.)

9. Can you observe any evidence of competition between members of a given species population of animals or plants? Yes____No____. If so, name the population and explain what the members of the species seem to be competing for.

10. Can you observe any evidence of competition between members of two different species populations, e.g., between members of two species of plants or animals? Yes____ No____. If so, name the populations and explain what they seem to be competing for.

11. What other kinds of interactions between members of different species populations can you observe here beside competition? Yes____ No____. If so, how is each organism affected by the other?

12. What evidence exists to indicate that food energy flows through this ecosystem? You may have to make some inferences, but there should be some evidence of this. (Again, if it will be helpful for you to do so, please feel free to diagram this flow of energy.)

13. What evidence exists, if any, to indicate that this ecosystem is more or less stable over time? You may want to think in terms of years, or longer periods of time such as decades or even centuries.

14. Some observers will apply the term "static" to a given ecosystem. The term "static" can be defined as showing little change over time. Is this a good term to apply to this system? Why or why not?

15. Do humans, in any way, play a role in this ecosystem? Yes____ No____. (Rarely would the answer be "No"!) Explain the role of humans in this system.

16. Is there any evidence that human activity threatens this ecosystem, or any part(s) of it, in any way? Yes____ No____. If so, explain how your evidence serves as in indication of threat to/within this ecosystem.

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Organizing Instructional Methods and Resources Around the Goals

Planning to address the goal levels presented in Part I requires the instructional planner to call upon her/his knowledge of, and skills particular to each goal level. Certainly, The General Teaching Model can serve as a general framework for instructional planning at each goal level. Nonetheless, differences in the objectives emphasized at each goal level requires the instructional planner to carefully consider which methods and resources could be used to help learners effectively realize those objectives.

There are a variety of methods and resource available to the instructional planner, and there is no "one best method" of instruction for addressing each goal level. However, this should not be taken to mean that all methods are equally effective. Neither research nor experience in this area bear that out (Iozzi, 1984). Thus, instruction at each goal level should inevitably call upon the instructional planner to utilize a combination of methods (and resources) which are available and which have been found to be effective.

Regardless of the teaching model used for curricular and instructional planning in EE, a number of teaching methods and instructional resources will prove necessary in order to maximize instructional effectiveness. Teachers cannot be expected to become effective environmental educators (i.e., change students' behavior) if they are prepared to use only lecture and discussion approaches in the teaching-learning process. For example, teachers cannot be expected to teach their students how to investigate issues unless: (a) they have first developed the skills and experience in issue investigation themselves, (b) they have been exposed to sound methods for teaching those skills, and (c) they have had guided practice in using these methods in their own teaching. Similarly, teachers will probably have difficulty in effectively using field trip or community resource strategies unless they have experienced these same strategies themselves. Thus, the preservice teacher education programme specialization in environmental education (TEP/SEE) must be developed and organized in such a manner so that preservice teachers are exposed to the range of instructional methods which they should be prepared to use in their own classrooms.

On the following pages the reader will find a chart which identifies some of the methods and associated resources which are recommended for use in teaching for the curriculum goal levels presented in Part I (Hungerford, Volk, Dixon, Marcinkowski, & Sia, 1988; Hungerford, Ramsey & Volk, 1989a). The environmental sensitivity level has been included due to its critical role in shaping environmental literacy .

In the text which follows the overview chart, a number of the methods described in the chart are explained and described in greater detail. The discussion of planning for instruction begins by addressing the use of community resources and field trips. This is followed by a brief discussion of approaches to teaching conceptual knowledge, and then, by a more extensive discussion of two broad approaches for organizing issue instruction; i.e., the case study and the issue investigation skill development approaches. Since both approaches may include the use of methods appropriate to the middle grades level (i.e., role-plays, simulations, panel discussions, and debates), these will also be presented. This section will close with a discussion on planning for action-oriented instruction.

A Goal-Oriented Framework for Organizing Instructional Methods and Resources

Goal Level	Available Methods	Available Resources
Environmental Sensitivity	Outdoor Education/Recreation	Natural Environments; Outdoor Education Centers, Recreation Areas, Etc. School Camping Programs, School Camps, National Parks, Youth Programs, Nature and Environmental Centers, Etc.
	Field Trips	Nature and Environmental Centers, Wildlife Refuges, Natural Areas, Sites of Environmental Impacts/ Issues, Etc.
	Historical/Current Reading	Books and Other Suitable Reading Materials.
	Presentation/Demonstration	Adult and Peer Role Models
		Film Viewing and Discussion Video Tapes, Movie Films and Filmstrips.
Ecological Foundations	Field Study (Local)	Natural Areas, Nature and Environmental Centers, Refuges, Etc.
	Simulations and Models	Computer Programs, Printed Simulations, Diagrams.
	Film Viewing and Discussion	Video Tapes, Movie Films and Filmstrips.
	Reading and Discussion	Texts and Other Print Materials
	Lecture and Discussion	Overheads, Worksheets, Lecture Notes, Followup Panel Discussions.

Conceptual Awareness	Field Trips/Observation	Local, Environmentally Impacted Sites, Other Issue-Related Sites
	Issue Analysis (of Players Positions, Beliefs, and Values)	Worksheets Involving Issue Analysis Components; Film and Print Materials as Referents.
	Simulations and Models	Computer Programs; Printed Simulation, Role Play and Game Materials; Diagrams
	Basic Case Studies	Teacher Developed Case Studies, Print Materials Related to Local Issues, Resource People.
	Brainstorming (Problems, Issues, Solutions)	Teacher Organized Brain-Storming Materials and Guidelines
	Film Viewing and Discussion	Video Tapes, Movie Films, and Filmstrips.
	Reading and Discussion	Texts and Other Print Materials
	Lecture and Discussion	Overheads, Worksheets, Lecture Notes, Followup Panel Discussions.
Investigation and Evaluation of Issues	Secondary Source Investigations	Libraries and Other Collections of Materials.
	Primary Data Collection	Data Collection Tools/ Instruments, Samples as Needed.
	Values and Moral Education Strategies (*)	Print Materials, Valuing Exercises.
	Simulations and Role Plays	Printed Simulation and Role Play Materials; Required Resources Made Available.
	Panel Discussions and Debates	Print Materials, Resource Persons, Required Resources Made Available.

Environmental Action Skills	Skills Training Sessions	Print Materials and Exercises
	Action Workshops	Community Resource Persons.
	Action Analysis	Worksheets Using Action Analysis Criteria
	Student(s) Action Projects	Teacher and Resource Persons as Supervisors/ Consultant; Required Resources Made Available.
	Action Learning Through Community Internships and Practica	Community Programmes and Projects, Cooperating Organizations.

* Note: Values and Moral Education Approaches include: Values Clarification, Values Analysis, Moral Dilemmas, and other commonly used strategies (see Hall, 1979; Hersh, Miller, & Fielding, 1980; Leming, 1981, 1985; Chazan, 1985; Caduto, 1985).

Community Resources and Field Trips

A few years ago one of the writers of this document had occasion to join a team of professional educators which was assigned the task of evaluating a rural secondary school in southern Illinois. This writer's specific responsibility was to inspect the curricular programme in the science department. One of the first things he noticed was the school's setting. The school was out in the country. Just south of the school, no more than 100 yards away, was a large tract of oak-hickory deciduous forest, unaltered and ripe for teaching ecology. In front of the school was a wide ditch which was water-soaked. In spots, standing water could be observed complete with plankton, associated water insects, and amphibians. Just across the highway lay a railroad track, and beyond the tracks was a very large segment of the National Forest, which covered much of the region.

Seldom, if ever, had the writer observed a school with such rich natural resources available within a five minute walk of the classroom. Excited with the prospect of finding a rich science program for students, the writer observed several classes and spoke with the teachers in the science department. The biology teacher was interviewed last. He was quick to inform the writer that he didn't allow his students out of the classroom, and therefore, didn't use the resources which were so close to the biology room.

Unfortunately, this situation is far more typical than one would like to admit. We often refer to the above situation as a "two by four classroom"; i.e., two covers of a book and four walls of a classroom. And, we are almost certain that students coming from such a classroom will not be developing increased environmental sensitivity, will only have limited ecological knowledge, will not be aware of the resources of the area, will not be able to investigate serious issues within the region, and will not know how to engage in efforts to resolve the important issues facing their community. In short, by not providing students

with opportunities to interface with appropriate community resources as a part of instructional programmes, we are seriously impairing students' ability to develop as environmentally literate citizens. This unfortunate state-of-affairs could, at least in part, be remediated by teacher educators who train preservice teachers in the strategies for using community/regional resources in their teaching.

The above scenario also stands in sharp contrast to those situations where teachers have not only sought to make use of the school site as an outdoor classroom for their students, but who have worked with their students to either set aside, or even improve their school site for this purpose (e.g., with tree plantings; plantings for insects, birds, and mammals; brush piles as habitats; watershed or stream clean-ups; and the like). In one school, a teacher developed a series of "around-the-seasons" lessons for teachers in her building to use with students on their school site. The use of the school site was advocated by the school district science coordinator and the school principal, and support for site development was provided by personnel from a state resource agency.

Similarly, in another local school district, the science coordinator has been working with teachers in each building to develop landscaping and lesson plans for their school sites. The science coordinator has also arranged with local college faculty to provide these teachers with an intensive inservice session focusing on the development and use of their outdoor classrooms. These are simple examples of how cooperation from a few key teachers and resource people can help to overcome the limitations of the "two by four classroom" by working to provide students with appropriate educational experiences using locally available resources.

Readers of this document should note that the above examples emphasized the use of one type of local/regional resource (i.e., school grounds) for instructional purposes at the 'Environmental Sensitivity' and 'Ecological Foundations' levels. As the previous methods/resources chart clearly indicates, there are other kinds of community/regional resources which could be used for instructional purposes at these levels, and there are many other kinds of community/regional resources which could be used for instructional purposes at the remaining three goal levels. What are some other strategies associated with the use of such community/regional resources?

Inventorying and Using Community Resources

One common strategy is the development of "resource inventories". The writers have been involved in a number of resource inventories in the United States over the past twenty years. A resource inventory is a printed inventory of both physical and human resources available for instructional use within a specified area or region. This inventory can take the form of a manual or book, it may be computerized, or it can simply be developed as a card file to be used by all instructors in a school programme. Regardless of the form, it will be important to include particular kinds of information about the resource and its instructional use in an inventory. Once an inventory of this type is developed, the critical question then becomes "Who will use it?".

Research is quite clear on the use of resources and resource inventories. Teachers who are familiar with area resources and who have thought through how to use them instructionally will use them far more than teachers lacking such experiences (Gardella, 1979; Wilke, 1980; Yockers, 1980; Wilke & Leatherman, 1983; Peyton, 1984). Researchers have found that those teachers who were trained in the inventorying of community/regional resources, and who were actually involved in the inventory process are the ones who will use those resources with their students to a far greater extent than will other teachers. This

holds true for teachers who are provided with training in resource inventorying, or who are provided with training in the use of a particular resource inventory (manual). Further, teachers who simply have access to a resource inventory (i.e., without special training in its use) tend to use such resources the least. In other words, if professional educators wish to see teachers use community/regional resources, they must train the preservice teacher to inventory resources and involve them in the development of a resource inventory (manual).

With these thoughts in mind, the writers have incorporated: (1) a sample of a Resource Inventory Worksheet, and (2) a fictional Sample Resource Inventory on the following pages. These are included for interested readers as general guides for use in developing resource inventories. The reader should feel free to use and/or modify the inventory form as is needed in her/his own particular situation.

What kinds of resources can be inventoried for an environmentally-related resource inventory? A few examples would include resource people such as wildlife biologists, game wardens, botanists and greenhouse workers, commercial fishermen, trappers and hunters, ranchers and farmers, waste disposal personnel, wastewater personnel, sewage treatment plant operators, energy plant operators, insect and pest control specialists, environmental organization activists, and local/regional government officials involved in environmental matters.

Other examples would include physical resources or resource sites such as national/state wildlife refuges and parks, national/state forests, typical ecosystem/biome sites, local parks having environmental potential, farms and ranches, zoos and botanical gardens, museums, fish hatcheries, sewage treatment plants, waterworks, garbage dumps (landfills) and other disposal sites, electrical utilities, energy mines and drilling sites, fertilizer industries, toxic waste dumps, university facilities such as departments of fisheries and wildlife, nature and environmental centers, and recycling centers. As may be obvious, the list of possible resource sites may be quite large. For this reason, each facet of a resource inventory should be planned carefully.

The Resource Inventory Worksheet

Name of the Resource: _____

Appropriate Content Area Usage: _____

_____

_____

Appropriate Resource Usage: Field Trip _____; In Class Use _____; Investigation by

Students _____; Other (Please Explain) _____

_____

_____

Address/Location: _____

_____

_____

Contact Person and Address: _____

_____

_____ Phone: _____

Facilities: Shelter _____; Restrooms _____; Other (Please Explain) ____

_____

_____

Suggestions for Use of the Resource: _____

_____

_____

_____

Use Limitations/Restrictions: _____

_____

_____

_____

Sample Resource Inventory for a File System or Print Document

Name of Resource: Kinkaid Wildlife Refuge (Fictional).

Appropriate Content Area Usage: Ecology, Environmental Science, Environmental Studies, Methods in Environmental Education.

Appropriate Resource Usage: Field Trip; Investigation by Students; Specialists Invited to Speak to Students in Class

Address/Location: The Kinkaid Wildlife Refuge is located fifteen kilometers west of Murphy. Written communication should be sent to:

The Refuge Manager
Kinkaid Wildlife Refuge
P.O. Box 1600
Murphy, (State) 00459

Contact Person and Address: Mr. Harry Insell, Refuge Manager or Dr. Armond Brewer, Wildlife Biologist, Telephone: 778-1420; 8AM - 5PM

Facilities: Shelter and Restrooms are available in the Main Refuge Building. This building also has a small auditorium. The two picnic areas on the refuge are available on a first-come first-serve basis. Each area has restroom facilities (outhouses), and consists of five sites, with two tables at each site.

Suggestions for Use of the Resource: Kinkaid Refuge is an excellent place for students to observe/study the typical deciduous forest, temperate grassland and pond communities. The refuge is home to ten species of endangered plants, and six species of endangered animals (i.e., birds, mammals, amphibians). Serious issues surround several of these animal species, and refuge personnel are willing to have supervised students observe/study these animals with some restrictions. Refuge personnel are also willing to speak to appropriate classes in schools within 30 km. on related issues with advance notice, or to be interviewed (in person, by telephone) by students conducting serious issue investigations.

Use Limitations/Restrictions: Although the refuge may be visited by any school group making arrangements in advance, supervised college students are the only students who can gain access to certain areas due to the potential threat to protected animal species, and potential danger to the students. Students will not be allowed in designated areas during certain nesting, rutting and mating seasons.

The Effective Use of Field Trips.

Since many community/regional resources involve the use of field trips, it is extremely important to give the TEP/SEE student training in their use. It is also important to make use of field trips during the TEP/SEE programme so as to give students first-hand experiences with resources and the contents associated with them.

In order to be maximally effective, the field trips should be task oriented. A simple excursion outside of the formal classroom can rarely, if ever, be justified as an effective use of time and resources. Therefore, it is up to the instructor to provide the parameters needed to insure success. The task for the student may be one of several types. It can involve a student-generated description of something (e.g., as in the Ecosystem Observation Activity). It can involve investigating and answering one important question in depth. It can involve some sort of inquiry which demands that problem solving skills (e.g., problem identification and definition) be applied. Or it can involve a survey which necessitates the use of an instrument students have prepared in advance for collecting specific on-site data (i.e., on the basis of critical observations).

An example of an inquiry-oriented field trip worksheet is included on the next two pages for consideration by interested readers. The reader should feel free to use and/or modify this worksheet as is needed in her/his own particular situation. It should also be noted that this particular field trip/worksheet could be used as one activity within the context of a larger solid waste case study developed for use at the middle school level by Hungerford, Ramsey and Volk (1989). A brief outline of this case study is presented in the next section.

Besides providing a definite task for students on a field trip, several other considerations are important. Of the considerations identified in the list on the following page, several, though not all, are crucial. Among these are: 1. A preliminary trip to insure that the instructor is familiar with the resource (as needed); 2. Arrangements for a visit to and use of the resource (as needed); 3. Arrangements for transportation (as needed); 4 Parent consent forms for participating students (as needed); 5. Plans for students' health and safety (e.g., preparation of first aid equipment on the basis of students' medical histories, conditions and medications; adequate provisions for water and food, and for restroom facilities); 6. Pretrip discussions with students about the nature of the trip, the resource, and their assigned tasks; 7. Pretrip preparation by students for required tasks, such as preparation of data collection instruments (as needed); 8. Discussion concerning student behavior on the trip; 9. Posttrip data analysis, synthesis, and reporting (e.g., by individual students, by small groups).

Other parameters may be needed, depending on the nature of the trip. If the instructor is taking the class on a trip to the landfill, for example, students may be assigned an additional task of observing litter/illegal dumping along the route to the landfill. Or, if the trip is to an excellent example of the dominant ecosystem (biome) in the region, the instructor may ask students to take notes enroute on the ways in which humans have modified this biome. Thus, even transportation time can be used effectively if arrangements and expectation are established with this in mind!

The Garbage Dump Field Trip Worksheet

Your Name: _____ Date: _____

1. Identify, in writing the location of this dump. What is the extent of this site in acres or hectares? (You may also wish to include a map and/or a drawing to further clarify location and size.)

2. What are the primary uses of land surrounding this dump? Is it primarily surrounded by undisturbed areas (e.g., woods)? By some form of business or industry? By farmland? By residences? Or, by some other form of land use? What are property values like for land adjacent to this dump? What kind(s) of problem(s), if any, does this dump present to area land owners? (You may also wish to include this information in your map or drawings.)

3. What size of an area does this dump serve; i.e., how far away do people live whose garbage winds up here? What is the approximate population of users (i.e., number of households or people using it)?

4. How do people living in the area use this as a waste disposal site? Included should be a list of the major kinds of waste observed here, and any apparent methods for the separation of these different kinds of waste.

5. Dumps can be classified as open dumps, basic and sanitary landfills (i.e., dumps with periodic soil covering, without or with attention to air and water pollution and pests, respectively), rubbish burning dumps, and secure landfills (i.e., for hazardous solid and/or liquid wastes). Into which category or categories, does this dump fit? Why?

6. Is this a legal dumping area; i.e., does it conform to the legal statutes governing waste disposal in your area? Yes ____ No ____. What is your evidence?

7. Is there any evidence that animals inhabit or regularly scavenge this dump? Yes ____; No ____. Which kinds of animals? Do these animals appear to present any health and/or safety problems, either to the animals or to humans? What is your evidence for this?

8. Are there any water ways within, surrounding, or nearby this dump site? Yes ____; No ____. Do these water ways receive runoff (surface) water from the dump? Is there any evidence that they receive groundwater discharge from the dump site? If so, what problems might (or does) this cause for the surrounding ecosystem?

9. Is there evidence of other kinds of pollution in the area of this dump? Yes ____; No _____. (Please consider air, noise and visual pollution.)

10. How long can users rely upon the present disposal site, without expansion and/or with planned expansion of this site; i.e., what is the projected lifespan of this as a disposal site? What are the future plans for waste disposal in this user area?

11. Are there alternatives to dumping for the people who are using this dump? Yes ____; No ____. If so, what are they?

12. Are any users of this disposal site currently utilizing any of these alternative solid waste disposal methods? Yes ____; No ____. If so, which methods are being used, and to what extent are they being used? Can you draw any conclusions about how these alternative practices relate to the projected lifespan of this disposal site? (*)

13. Can this disposal site be reclaimed? Yes ____; No ____. If so, how can, or how should this be done? Are there any legal restrictions/regulations governing the reclamation of garbage dumps?

14. What could your class do to attempt to remedy potential/actual problems surrounding this situation? In the case of illegal dumping, should you/your class get involved in this kind of controversy? Why (or why not)?

* Note: Readers may recognize that, in order to generate an adequate response to this particular question, students will be required to develop and use some form of questionnaire (e.g., given to users at the disposal site). A questionnaire suited for this purpose was included in Hungerford, Ramsey, and Volk (1989), and has been reproduced in the next section of this document.

Teaching for Conceptual Knowledge in Ecology

The knowledge of ecological concepts and principles is seen as critical since it is invariably called into play when interpreting the ecological dimension of complex environmental issues. Seen in this context, the authors take the position that it is more appropriate for instruction to focus upon the acquisition and application of ecological concepts and principles than to focus upon knowledge of ecological facts per se.

According to learning theory, concepts may be defined as mental images, or packages of understanding and meaning which help humans interpret/classify everyday objects and events, or the relationships among those objects and/or events. Further, it is important to note that concepts may be related, and organized into broader mental frameworks often referred to as "conceptual schemes" (Klausmeier & Harris, 1966; Bruner, Goodnow & Austin, 1977; Wadsworth, 1978; Driver, Guesne, & Tiberghien, 1985). Without getting lost in theory, it is important to point out that these mental images (concepts), individually and collectively, shape the way we interpret and respond to everyday phenomena.

For example, in the past, many individuals viewed undisturbed forests as wilderness to be feared or tamed, or as wooded areas (e.g., Nash, 1982; Bergon, 1980; Brooks, 1980). Without the benefit of insights derived from a knowledge of ecological concepts, it would have been difficult for such individuals to comprehend the forest from an ecological perspective (e.g., as a habitat for animal species, as a dynamic biotic community in a particular successional stage, and so on). When individuals have the benefits of such knowledge (i.e., such a conceptual scheme), at least they have the opportunity to understand and appropriately respond to the forest as an ecological entity. It should be noted, however, that many other variables have been found to influence a person's behavior (Hines & Hungerford, 1984; Hines, et al., 1986/7; Sia, et al., 1985/6), and so, readers should be careful not to overemphasize the influence of (ecological) knowledge on behavior.

Surveys of programme and teaching practices in EE indicate that ecology is taught quite extensively across the U.S. (Childress, 1978; Champeau, et al., 1980; Disinger, 1981; Volk, et al., 1984), and in other parts of the world (Unesco, 1977; Unesco-UNEP, Quarterly). However, research also indicates that school groups and samples of the general public are limited in their comprehension of many ecological concepts, particularly in more complex areas such as population, adaptation, and evolution (Marcinkowski, 1984). Since knowledge of ecology serves as a critical foundation for interpreting aspects of many environmental issues, this goal level should not be treated lightly. Careful instructional planning is required here. For example, simpler definitions of a given concept should be introduced before more complex definitions (e.g., a community as a group of plants and animals living together in the same area, before a community as a food web or as a system of energy transfers), and simpler concepts should be introduced before more complex ones (e.g., as in the SCIS life science hierarchy). Planning should take into consideration that individual concepts and conceptual schemes can expand over the course of instruction. One example of a well developed instructional plan for teaching ecological concepts in middle school settings is presented by Hungerford, Ramsey and Volk (1989; See Chapter III).

There has been extensive theoretical development in the area of concept learning over the past twenty-five years. Some of the resulting theory is apparent in the previous discussion, and much if it is more-or-less applicable to the learning and teaching of ecological concepts at the middle school level. What follows is an introduction to five theorists' views and approaches on teaching and learning concepts. These have been included on the premise that approaches used to organize the teaching of ecological concepts can be enhanced by drawing upon what is known about teaching and learning concepts in science and other subject areas.

The three main components which are usually involved in the learning/teaching of any concept are: (a) direct and indirect experiences, (b) language used in labeling and describing the objects/events of experience, and (c) mental images or representations of those objects/events, or of the classes of objects/events to which they belong. Thus, learning theorists tend to concur that some form of experience is necessary to help build and shape

accurate concepts or images. Conversely, a reliance upon language alone to help shape concepts can be unnecessarily limiting...the potential for misunderstanding and misinterpretation is enormous, and the subsequent difficulty of helping students unlearn misconceptions in favor of more adequate conceptual understandings has been found often to be difficult (Osborne & Fryberg, 1985; Driver, Guesne, &Tiberghien, 1985).

The Theories of Bruner and Karplus

In any event, it appears that experience with objects/events, coupled with the learning of language to identify and describe those objects/events does contribute to the formation of concepts (i.e., mental images). Learning and instructional theorists have tended to emphasize these three components in differing ways, and therefore tend to approach or organize concept instruction differently. Models based upon the work of theorists like Bruner and Karplus emphasize instruction on a particular concept (e.g., habitat), while models based upon the work of theorists like Piaget, Ausubel and Novak emphasize the relationships among a set of associated concepts (e.g., the relationships among the environment, range, habitat and niche concepts).

For example, according to Bruner's model, it would be important to help learners differentiate between positive and negative examples of a concept (e.g., all green plants serve as examples of producers), and between defining and noisy characteristics of a concept (e.g., not all producers have roots). Within this model, the set of defining characteristics serves as the concept rule or definition (Joyce & Weil, 1980). The most common ways of presenting examples and characteristics are through direct and/or indirect experiences. Indirect experiences might include the use of pictures and line drawings, slides, filmstrips, and the like in classroom settings. These kinds of experiences could provide learners with opportunities to observe, compare and classify an array of objects/events with relative ease, and thereby contribute to the formation of concepts.

Another model, Karplus' "Learning Cycle", places great emphasis upon the instructional role of direct experiences (Karplus, 1967; SCIS, 1968, 1974). The cycle begins with direct experience (the *exploration* of objects/events), shifts to the description of experiences and the introduction of terms for the concept being emphasized (the *invention* of the concept), and ends with the application of the invented concept to a new set of objects/events via direct experience (the *discovery* of applications for that concept).

Since the learning cycle is designed to incorporate direct or 'hands-on' experience of objects/events associated with the selected concept, laboratory (e.g., fruit fly populations, aquaria and terraria) and field experiences (e.g., observations of pond life and terrestrial micro-communities) are seen as crucial components to the teaching and learning of concepts (e.g., population growth, species interaction, biotic community). These kinds of experiences are emphasized in ecology-related curricular materials developed around the learning cycle (e.g., SCIS, SCIS II, SCIIS). In addition, the Ecosystem Obervation Activity presented earlier in this section could easily serve as a field-oriented discovery activity. The learning cycle has proved to be a powerful instructional model in theory and in practice.

The Theories of Piaget, Ausubel and Novak

The theoretical work of Piaget, Ausubel and Novak stipulate that related concepts are organized into broader frameworks often referred to as conceptual schemes. However, while Ausubel and Novak emphasize the importance of helping learners understand in meaningful

ways the relationships among various associated concepts, Piaget tends to emphasize the importance of relating both common and new experiences to one's conceptual schemes (Joyce & Weil, 1980). Thus, the work of both Ausubel and Novak concentrates more on maximizing meaningful conceptual growth using deductive, verbal/reception learning strategies, while Piaget's work concentrates more upon expanding students' conceptual understanding using inductive, experiential learning strategies.

According to Piaget, one's conceptual schema is used to mediate, or interpret experiences. New experiences may either be assimilated (i.e., easily interpreted using one's conceptual schema) or accommodated (i.e., not easily interpreted, and so, serve as a disturbance and an incentive to modify one's scheme so that it is more adequate in interpreting this type of experience). As a result there are basically two instructional approaches which make use of these ideas. The first is to organize instructional experiences such that they build upon previously learned concepts (e.g., present predator-prey relationships in terms of the previously learned consumer concept). The second approach encourages accommodation by intentionally providing learners with an event they cannot easily interpret (Joyce & Weil, 1980). Since instructors often cannot plan on encountering such discrepant events during field trips, it is more common to organize these as demonstration and/or laboratory experiences (e.g., Lien, 1987). On a practical basis, these usually pique learners' curiosity, while on a theoretical basis, these can lead to a modification of learners' conceptual schemes.

Though the work of Ausubel and Novak are closely related, their ideas will be presented separately. The phrase which best characterizes Ausubel's view is "Discern what students already know and teach them accordingly". The term he uses to describe the kind, clarity, sophistication, and organization of known concepts is cognitive structure. In addition, Ausubel emphasizes the relationship between learners' cognitive structures and the way in which subject matter is organized within the disciplines. These views hold several important implications for concept teaching and learning: (a) effort should be made to discern what students do and do not know about a set of concepts to be taught; (b) early in instruction, a bridge should be provided between what students already know and what they will be learning; (c) a cohesive structure for the concepts to be taught should be provided; (d) the instructional sequence should begin with the most general points, and gradually progress into greater and greater detail; and (e) activities should be structured which relate the new concepts to one another, and to previously learned concepts (Ausubel, Novak, & Hanesian, 1978; Joyce & Weil, 1980).

The instructional approach which Ausebel is probably best known for is the advance organizer; an approach which attempts to address points (b) and (c) above. An advance organizer is basically an introductory statement presented before other learning tasks. It serves to introduce the concepts to be learned, and attempts to tie what learners already know to those concepts at a higher level of abstraction and inclusiveness (i.e., using broader concepts) than will be used in the subsequent learning tasks. Its purpose is to help students begin to develop an overarching conceptual structure into which the concepts to be taught will fit. Advance organizers have been used effectively prior to field-based instruction. In addition, post-trip discussions would serve as an ideal opportunity to address point (e) above.

Novak expresses many of the same concerns as Ausubel with respect to concept learning. However, his response to the five points (a-e) identified above has involved the development and use of concept mapping as an educational tool. According to Novak and Gowin (1984),

> Concept maps are intended to represent meaningful relationships between concepts in the form of propositions ... propositions are two or more concept labels linked by words in a semantic unit ... concept maps work to make clear to both students and teachers the small number of key ideas they must focus on ... a map can also provide a kind of visual road map showing some of the pathways we may take to connect meanings of concepts in propositions (p. 15).

As the name implies, concept maps are visual and semantic representations of relationships among a set of associated concepts (e.g., among the concepts associated with a broad concept such as population density, or ecological succession). Concept maps have been used for curricular, preassessment, instructional, and evaluation purposes. For example, an instructional planner may attempt to map the primary concepts he or she intends to cover in a unit on species interactions (e.g., which may be intra-specific or inter-specific; and these in turn may be competition, predation, or symbioses; and symbioses may be mutual, commensal, or parasitic; and so on). Assuming that students have been taught how to concept map, the instructor may ask students - individually or collectively - to create a map for the key concept "species interactions" prior to other learning tasks.

While collective mapping does not provide insight into the conceptual scheme of each student, it does allow for extended discussion of concepts relevant to this key concept. In addition, a map created for curricular purposes may be formalized and shared with students at the outset of the unit as a road map of concepts to be covered. Students may then use this map as a guide for note-taking or studying. If a map is not provided, students may be encouraged to create their own from reading and lecture notes. Following one of Ausubel's ideas, concept mapping may be used by the instructor as a synthesis tool, whereby the concepts taught are linked together in a map, and perhaps even linked to other concepts previously learned. Finally, students familiar with mapping may be asked to do so as part of a unit test (Novak & Gowin, 1984). While concept mapping is a relatively new strategy, it has proven to be both a flexible and a useful tool.

Readers are encouraged to consider how these five views and approaches may be used separately, and, at more advanced levels, in various combinations, to help improve instruction and learning of ecological concepts. Since this only serves as a general introduction to each theorist/approach, interested readers are encouraged to explore these theorists' ideas further using materials cited in the bibliography. While this kind of exploration may be useful for some, for others it may be appropriate simply to use a basic combination of classroom, field and laboratory exercises which seem to work best with their students (i.e., which generate enthusiasm and effective learning).

Methods Associated with the Teaching of Issues

Perhaps the major content area associated with environmental education (EE) is that of environmental issues (e.g., Harvey, 1976; Hart, 1981). Similarly, given the unique developmental characteristics of the middle school learner, it seems appropriate to focus instruction on real-life problems, and on the encouragement of independent, critical thinking. It would appear that a major and recommended focus might be that of environmental issues and alternative solutions ... their identification, analysis, investigation, evaluation, and eventual remediation.

What is an environmental problem and an environmental issue? Probably the simplest definition of an environmental problem is as follows: those bio-physical conditions in the (natural) environment which may be deemed impacts, threats or risks on the basis of

human-environment interactions. For example tropical rainforest destruction has been referred to as an environmental problem since there are observable biological and physical impacts, as well as potential long term risks from those impacts.

The definition of an environmental issue follows from this: those environmental problems or conditions on which there are differing socio-political views (differing human beliefs and values). For example, differing individuals and/or groups may disagree about the existence of a problem; about the causes, the magnitude or the importance of an apparent problem (e.g., acid rain, toxic waste sites, harvest of whales); or even about which of the alternatives would serve as the most acceptable or effective solution. These disagreements may range from being relatively confined to widespread and from civil to openly hostile, and may reflect any combination of beliefs (i.e., scientific and otherwise) and values.

Examples of issues fitting this definition would include those noted above, as well as: human population growth, land-use management, nuclear power generation and waste disposal, surface and ground water contamination, endangered species and habitat destruction, clear-cutting in temperate forests, desertification, marine fisheries management, loss of non-renewable energy resources and mineral resources, pesticide use and food production, depletion of aquifers, conversion of wetlands to agriculture or residential areas, loss of topsoil and non-point source pollution, solid waste disposal, beverage container legislation and recycling, air pollution, noise pollution, and loss of genetic diversity in food crops. Any set of issues may be labeled or categorized in a variety of ways, for the problems/issues are not isolated entities as these separate labels or categories might imply.

For the purposes of this section, the term issue will be used more generally to refer to both problems and issues as defined herein. Thus, the writers have established two rules which govern the identification of an environmental issue: (a) it must relate to some environmental problem; i.e., apparent bio-physical impact, threat or risk; and (b) it must truly be an issue; i.e., there must be evidence that people disagree about the status or resolution of that problem. In short, it must have social and/or ecological significance. When a problem/issue meets these criteria, one can assume that an environmental issue has been identified.

What Should the Outcomes of Issue Instruction Be?

Professionals in the field of environmental education (EE) have agreed that a major goal for EE is " to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment" (Unesco, 1978, p. 26). As implied in the quote, this goal subsumes a number of prerequisite skills. These skills include: (1) the ability to identify environmental issues; (2) the ability to analyze issues by correctly identifying sub-issues, parties at issue (players), positions taken on the issue/sub-issues, and the beliefs and values associated with those positions; (3) the ability to investigate issues in a manner so as to identify the facts surrounding them and their potential solutions, along with their social, economic, political, legal and ecological ramifications; (4) the ability to evaluate issues and to determine the best approach for resolving it; (5) the ability to develop an "action plan" which can be implemented in an attempt to resolve, or help resolve a particular issue; and (6) the ability to execute an "action plan" if that plan is consistent with her/his values.

These are not instructional objectives (intended outcomes) familiar to most instructional planners (Childress, 1978; Wilson, 1988), even though they are recognized to be important (Champeau, et al. 1980; Volk, Hungerford, & Tomera, 1984). Meeting these

objectives will necessitate a great commitment on the part of the professional education community, and specifically, of the TEP/SEE instructors.

Meeting these instructional objectives is not an easy task. If we look at the body of research concerning issue-oriented instruction, several important findings become apparent. These include:

1. Although textbook coverage of issues is on the increase, there is a general lack of issue coverage available for use by the teacher. Where issue coverage is present (e.g., in science texts), it tends to be at an awareness level, without opportunity for indepth issue skill development or training for citizenship responsibility (e.g., Stevenson, 1986).

2. While issue instruction is on the increase, it is not a pervasive area of instruction in today's classrooms. Where it is found, it remains, by and large, an awareness activity. Thus, the critical outcomes of issue instruction are not being realized to any measurable degree (e.g., Childress, 1978).

3. If citizenship participation is a desired state for students (either preservice teachers or middle school students), it will not be attained by teaching issues at an awareness level (e.g., Sivek, 1982; Ramsey, et al. 1981). If we want our students to be responsible citizens, we must help teach them how to do do this.

4. Where print materials and issue instruction have moved learners beyond the awareness level, this has been found to contribute to middle level students' academic success, intellectual growth, and citizenship involvement in issue remediation (e.g., Klingler, 1980; Volk, 1981; Ramsey, et al., 1981; Jordan, et al., 1986; Ramsey, 1987; Holt, 1988).

It appears, then, that issue instruction can and must transcend a simple awareness of issues, and provide more direct training in the skills noted above if we are to expect students to be able to use these skills as citizens in the issue resolution process. As noted in the last point (# 4.), the writers have witnessed the successes of such training efforts with middle level preservice and inservice teachers, and with their students, and so, know that such efforts can be very worthwhile.

With these thoughts in mind, the writers recommend four instructional levels to be used in issue instruction and present these goals on the following page. These instructional levels are simply a modified version of the curriculum goals presented in Part I. In this instance, they have been modified after looking at issue instruction, and more specifically, at what the elements of issue instruction should be.

What are the Options for Organizing Issue Instruction?

As noted in the chart on instructional methods and resources for teaching at each goal level, there are a number of options available for issue instruction. Methods commonly used to help learners develop an awareness of various environmental issues include: (a) field trips to regional sites where impacts or threats are apparent; (b) films which portray environmental issues (i.e., ranging from a survey of issues to the treatment of one issue in depth); (c) basic case studies which provide in-depth analysis of particular issues, often in

Instructional Levels for Issue Instruction

Level I. The Foundations Level
At this instructional level, learners are provided with the prerequisite scientific knowledge (content) needed to identify, understand, and investigate the issue(s) in question.

Level II. The Issue Awareness Level
At this instructional level, learners are provided with the conceptual knowledge associated with a variety of discrete issues. Learners develop an understanding of the "anatomy of issues" including bio-physical and socio-political aspects of issues, and a recognition of the various beliefs and values held by interested parties which impinge so heavily upon the origin and resolution of issues. At this level, learners also become involved in analyzing the ecological and cultural implications of issues and their resolution (e.g., economic, social, legal and political consequences). Finally, at this level, learners develop a deeper understanding of the need for them to become involved in issue investigation, evaluation, and resolution.

Level III. The Investigation and Evaluation Level: Training and Application
At this level, learners are provided with the knowledge and skills necessary to permit them to investigate/analyze issues, and evaluate alternative solutions for resolving those issues. Learners also become involved in the investigation process, including data collection and interpretation, as well as the drawing of and communication of conclusions.

Level IV. The Issue Remediation Level: Training and Application
At this level, learners develop those skills necessary for making responsible decisions concerning the resolution of environmental issues. Likewise, learners are provided with the opportunity to prepare and evaluate "action plans" for issue resolution. Additionally, it supports learners in the application of action strategies if and when they are motivated to implement their action plans.

issues, often in a particular location over a set period of time (e.g., Tanner, 1976; Wilson & Tomera, 1980; Childers, 1981); and (d) reading materials, including texts, books, periodical literature and other materials likely to carry information about issues. Newspapers and files of newspaper clippings are two of the most common and effective sources of print information about issues of local significance.

The above methods can also be used to address most of the conceptual awareness goal statements presented in Part I. However, instructional planners must be careful to insure that the particular resources to be used cover topics emphasized in those goal statements. For example, many, though not all film specials by Cousteau could be used in instructional segments designed to address goals emphasizing the need for issue investigation (Goal #9), and the need for responsible citizenship action (Goal #11).

Similarly, films and print materials addressing a particular issue gathered from differing sources could be used in addressing the goal emphasizing the role of differing positions, beliefs and values in an issue. For example, a review of film and print materials on acid rain consciously gathered from varied sources (e.g., The Acid Rain Foundation, Canadian Coalition on Acid Rain, The Conservation Foundation, National Film Board of Canada, Edison Electric Institute, National Coal Association, National Acid Precipitation Assessment Program, etc.) could be used in this way. Further, these materials could be used as the informational basis for developing some kind of simulation or role-play in which students construct and defended particular positions (e.g., a joint Canadian-American Board hearing on a newly proposed legislative initiatives pertaining to reductions in sulfur and nitrous oxide emissions).

After students have been exposed to various resources and participated in various activities pertaining to a select issue, a brainstorming activity could be used to help them identify and discuss the variety of approaches which could be used to remediate that issue (Goal #8). These kinds of activities are important since they can help learners develop broader views about and insights into environmental issues. However, readers must realize that if and when issue instruction is stopped at this point, as is often done, learners will not have had the opportunity to developed those skills previously identified as desired outcomes of issue instruction.

In response to this, the writers suggest that issue instruction consists of a series of activities designed to cut across the four levels of issue instruction. Further, there appear to be two promising, and educationally viable alternatives for accomplishing this within the teacher education specialization (TEP/SEE), and subsequently, at the middle level. Both of these options are flexible, and so may be used in either core courses or on an infusion basis. One of these option entails the development and used of extended case studies for presentation in science and social studies classrooms. The other focuses upon training students in those skills which will permit them to investigate issues on their own, and subsequently, upon providing them with opportunities to do so. Both of these options can allow for indepth issue coverage.

Both options can also be easily adapted for use across the middle level grades. However, if one programme were to consider using both options, the case study option is probably more appropriate for use in the lower middle level grades, and the skill development option in the upper middle grades. Use of both options across the middle level grades would certainly provide the learners with adequate opportunity to develop all of the skills identified as desired outcomes of issue instruction. Thus, under these circumstances, it is appropriate to prepare middle level teachers to use both options.

The Case Study Format of Issue Instruction. Many readers will no doubt recognize that the term "case study" is used in a number of divergent ways within educational circles. For example, some case studies are descriptive and/or analytic reports of conditions in a given context over a set period of time (e.g., Caldwell, Hayes, & McWhirter, 1976; Schoenfeld & Disinger, 1978; Berger, 1986; National Research Council, 1986). While these may be termed educational case studies in so far as they review educational conditions, or may be used in educational settings, they are not designed for use in K-12 settings per se. Case studies designed for use in K-12 settings usually include a variety of print and non-print resource materials, as well as a set of accompanying lessons or student activities. This is the general meaning of the term case study as used in this document.

Interested readers may recall that, in the previous discussion of issue instruction, the phrase "basic" was added to case study to denote a sole emphasis upon issue awareness (Level II), while the term "extended" has been used in reference to a case study approach which contains activities at all four levels of issue instruction. This extended case study approach serves as the specific meaning of case study used in this document. For this reason, the extended case study approach will be described in detail, and hereafter, it will solely be referred to as the case study approach

In this context, an issue case studies is, by and large, a teacher-directed analysis of a particular environmental issue. It is an approach for organizing instructional methods and resources (i.e., primary and secondary source material) around the delivery of issue-focused information and skills to students. In other words, these sources are, at least initially, used by the instructor to develop students' knowledge base concerning the issue. Once students are oriented to the issue, the instructor then leads students through an investigation of the issue (e.g., on a classwide, small group, or partnership basis). Such a strategy could involve the students in a search of additional secondary sources of information, searching perhaps for new data sources that could be reviewed and integrated by the class. Or it could involve a class in decision making concerning new information needed, or questions which need answering at the local community level.

If the instructor/class decides that primary information is needed, this could lead to the development of survey instruments (questionnaires and/or opinionnaires), and the production of an instrument that the entire class could administer in the community/area. Of course, this would lead to the collection of primary data which would be recorded, analyzed and interpreted by the class. Once the class has considered the implications of their data for that issue, they are likely to be ready to make decisions concerning what should be done with respect to that issue (e.g., to act if the potential for issue remediation is high). Regardless of the decision of the instructor/class regarding taking action on this issue, students should be provided with guidance and practice in the development of action plans.

The case study approach provides the teacher with a substantial amount of flexibility and control. The manner and extent to which the issue is dealt with is in the hands of the teacher, unless the teacher decides otherwise. The teacher can choose the issue, determine the methods to be used, make decisions concerning the depth to which the issue will be studied/analyzed, select the exact point at which the case study will be infused into the existing curriculum, and determine the length of time to be spent on the case study.

There is, however, a price that must be paid for flexibility and control! The costs involve time, energy, and skill in putting the case study together. Most issue case studies are "do it yourself" curricula, with the instructor serving as curriculum designer. While students can be involved in the selection of case study topics, that responsibility generally rest with the instructor. So, too, does the responsibility for finding and selecting source material such as printed matter, video tapes and films, guest speakers and panel discussion members, field trips, and simulations or role-plays. Handouts and exercises must be prepared. Evaluation instruments must be designed. The development of an educationally sound and interesting case study is certainly not an easy task. If such efforts are carefully undertaken, they will have payoff value for both teacher and student.

In order for a teacher-developed case study to be maximally effective, it must attend to variables which will contribute to changes in learner behavior. As mentioned, the writers believe that issue instruction must address the four levels of issue instruction in order to have a realistic chance of changing learners' behavior (e.g., their autonomous involvement in a local conservation project). These four levels were: (1) Foundations; (2) Issue Awareness; (3) Investigation and Evaluation; and (4) Citizenship Responsibility.

On the following pages, an outline of a solid waste case study (A Science - Technology - Society Case Study: Municipal Solid Waste, Hungerford, Ramsey & Volk, 1989a) is presented. It has been included here to demonstrate how these four instructional levels might be incorporated into a specific issue case study.

The Solid Waste Issue: An Outline of a Sample Case Study

Target Audience: Grades 6-12 (U.S.A.)

Instructional Level I: The Foundations Level

Outcomes at the Foundations Level: The focus at this instructional level will be directed at relevant science and social science concepts associated with solid waste. These concepts include: energy, mineral and material resource; renewable and non-renewable; solid waste and waste generation; organic and non-organic; biodegradable and non-biodegradable; micro-organisms, decomposers, parasites, and disease; surface and ground water movement; soil, soil type and soil profile; consumer products, consumables and disposables; marketing, advertising and packaging; municipal, agricultural, mining, industrial, and medical waste; hazardous and toxic waste; waste disposal, litter/littering, illegal and open dumps, landfills and incineration; material, biological, and chemical waste treatment; waste reduction and recovery; and reuse, returnable, and recyclable.

Delivery Activities for Instructional Level I. Eleven activities were designed to help students realize objectives associated with the acquisition and application of the above concepts. These are:

1. Presentation of an advance organizer which highlights the magnitude and importance of solid waste on a national and international basis.

2. Reading assignment entitled "Supper Around the World", with a follow-up activity emphasizing the description and comparison of sample suppers (i.e., for food sources, packaging, waste disposal).

3. Reading and graphing assignment entitled "What is Solid Waste?".

4. Class members prepare for, conduct, report on and discuss an inventory of hazardous household products.

5. Small groups prepare a comparative analysis of refuse produced per person per day in fourteen cities from provided data. Groups report and discuss implications of their findings.

6. Information and activity focusing on the trend of increasing solid waste produced in the United States.

7. Reading assignment entitled "Why So Much Garbage?", with a follow-up activity emphasizing the analysis of various kinds of food packaging (i.e., for packaging type, marketing, waste disposal).

8. Four part reading assignment and activities entitled "What Happens to Solid Waste?" (includes information/activities related to littering and open dumps, landfills, solid waste incineration and ocean dumping, and recycling).

10. Small groups classify, and then describe the best disposal methods for a set of waste items. Subsequently, groups report out and discuss their results.

11. Field trip to a local landfill or guest speaker who is knowledgeable about solid waste, with accompanying worksheet on what happens to our garbage.

Instructional Level II: The Issue Awareness Level

Outcomes at the Issue Awareness Level: The focus at this instructional level is simply issue awareness; i.e., the conceptual knowledge directly associated with the issue itself. This includes knowledge of: (a) the problem (bio-physical); (b) the causes of the problem; (c) the components, manifestations and consequences of the problem; (d) the issue(s) surrounding the problem (socio-political or socio-ideological); (e) the main parties at issue (players); (f) the players' positions on the issue and their beliefs concerning the issue; (g) the factual nature of and type of values inherent in the players' statements; and (h) the alternative solutions for the issue and the potential consequences of these solutions.

Delivery Activities for Instructional Level II: Six activities were designed to help students realize objectives associated with the acquisition and application of conceptual knowledge of issues in the above areas. These are:

1. Reading assignment entitled "The Lorax" by Dr. Seuss (T.S. Geisel). Small group discussion of the story, its analogs and its implications.

2. Class members are provided with training in the identification of problems and associated issues. Subsequently, they engage in an analysis of the problems and the issues apparent in "The Lorax".

3. Class members are provided with training in the identification of the parties at issue (players), and of the positions they take. Subsequently, students engage in an identification of the players in "The Lorax", and the positions these players take.

4. Class members are provided with instruction in the identification of beliefs and values associated with or implied in players' statements. Subsequently, students are provided with an activity in which they attempt to identify values associated with select belief statements from "The Lorax."

5. Class members are provided with a list of carefully selected articles pertaining to solid waste management. In pairs or in small groups, students select and read a minimum of one article from the list. For each article, students identify the problem(s) and issue(s) presented, and then conduct an "Issue Analysis" of it (i.e., identify players, positions, beliefs and values presented in it).

6. In building on the previous activity, the teams or groups of students report on and discuss the results of their readings and analyses. Class members

are then provided with training in "issue webbing", a technique designed to help students graphically depict the relationships among the various dimensions of an environmental issue in a meaningful way. Small groups of students are then provided with large sheets of paper, and construct an issue web for solid waste issues encountered to date. If the instructor and students wish, the whole class may attempt to construct one issue web after each small group has shared its results.

Instructional Level III: The Investigation and Evaluation Level - Training and Application

Outcomes at the Issue Investigation and Evaluation Level: The focus at this instructional level is upon the modeling of those skills used in the investigation of issues using secondary and primary sources of information. Skills involved in the primary collection of data include: (a) problem identification, (b) the generation of research questions, (c) the formulation of a strategy and/or instrumentation for data collection, (d) the careful recording and/or collection of data, (e) the analysis and interpretation of data, and (f) the communication of results, as well as limitations and implications of those results. Another critical component at this level is the analysis and evaluation of the issue following the completion of an investigation using secondary and/or primary sources.

Delivery Activities for Instructional Level III: Five activities were designed to help students realize objectives associated with the acquisition and application of issue investigation and evaluation skills noted above. These are:

1. The instructor provides students with an overview of the issue investigation process using both secondary and primary sources of information. Optional worksheets are included, should the instructor desire to provide training in the skills associated with issue investigation/evaluation.

2. Three instruments for primary data collection are provided for use in collecting local/regional data relative to solid waste issues.

3. Students are provided with information on the use of letters of request as a means of obtaining information from experts, resource persons, or organizations involved in solid waste management issues. Students may be asked to help generate a list of such individuals/groups or may be provided with one by the instructor. The drafting of such letters may involve background reading on a specific organization so that students have some idea about what to ask (and not to ask) of that individual/group in their letter. Subsequently, students are provided with a model of a request for specific information in response to specific questions, and with a list of agencies and organizations which might be helpful in obtaining that information. In small groups, students practice drafting letters requesting specific information about solid waste from an individual/organization of their choosing.

4. Once students feel familiar with investigation strategies and skills, the teacher may have students identify some facet of the solid waste issue to investigate, and then carry out an investigation of it. Similarly, the instructor may wish to identify a local solid waste issue appropriate for investigation, and lead the entire class in a group investigation.

5. Once students have completed their analyses (as a class, or in small groups), they should be provided with an opportunity to verbally report on their investigation, and to discuss the limitations/implications of it. The instructor may also require that each group prepare a final written report of their investigation.

Instructional Level IV: The Issue Remediation Level - Training and Application

Outcomes at the Issue Remediation Level: The focus at this instructional level is to guide students in the use of responsible citizenship participation/action strategies, both as individuals and as members of a group. This instructional level includes a knowledge of the participation/action strategies and the levels at which they may be used, as well as skill in selecting, planning, evaluating, and applying those strategies in a responsible manner.

Delivery Activities for Instructional Level IV: Five activities were designed to help students realize objectives associated with the acquisition and application of action-oriented knowledge and skills noted above. These are:

1. Class members are provided with introductory information entitled "Students and Issues". This lesson focuses on background knowledge related to issue resolution skills and on the responsibilities which accompany citizenship participation.

2. Class members are asked to identify and analyze alternative solutions for the solid waste issue(s) which they investigated.

3. The instructor next leads students in the development of an "action plan"; i.e., a plan for using one or more strategies to address the remediation of the solid waste issue they investigated. Ideally, this plan should contain: (a) a list of required resources and the the means for obtaining them, (b) a sequential list of tasks to be undertaken (a timetable), (c) an identification of who will be responsible for the completion of each task, and (d) a communication strategy for maintaining cohesiveness among group members throughout the course of planning and implementing their plan.

4. Upon completion of their action plans, students evaluate their plan(s) prior to implementation using "The Action Analysis Criteria Worksheet". Once student have completed their analyses, they should report on their results to the instructor and/or class members. Finally, these results should be used to modify their plan(s) as needed.

5. The instructor and students arrive at a decision about the implementation of their action plans. Instructors cannot not demand that students do this, and students must respect any limitations the instructor imposes with respect to the implementation of their action plan as a school-sponsored and school-sanctioned activity. Nonetheless, there is no substitute for the experience gained by students in the process of actually carrying out their plans, and so, instructors are strongly encouraged to provide such opportunities for students.

The Investigation Skills Approach. The case study approach to issue investigation focuses on only one issue at a time (e.g., desertification or tropical rain forest destruction; international whaling; management of the African elephant, Siberian tiger, Chinese panda, or Canadian grizzly bear). The issue serves as the organizing theme for the content and objectives of case study instruction. As a result, the instructional activities are almost exclusively issue specific.

In contrast, the investigation skill method employs a broader, more generalizable approach to the process of issue investigation. The intent of the investigation skills approach is to help students develop those skills involved in issue investigation and resolution so that learners can apply them throughout their life. Unlike the case study approach, the investigation skills approach provides for the definition, practice, and application of knowledge and skills needed by learners to independently investigate and resolve a range of environmental issues.

Investigation/evaluation skill development builds on the awareness level and through to the action level of issue instruction. At the awareness level, students learn to differentiate between environmental problems and issues and, in doing so, gain a very important understanding concerning the nature of environmental (social) issues; i.e., people disagree about the presence, causes, and/or extent of a particular problem; about the importance of that problem; and/or about the solution of that problem. In turn, such disagreements are based upon the differing beliefs and values people hold with respect to a problem. This understanding provides the basis for the development of a critical skill, that of issue analysis.

The ability to analyze issues involves the identification of the differing individuals and groups involved in the issue (players), and the positions taken by those players regarding issue resolution. Also involved in issue analysis are the identification and comparison of the beliefs about the issue held by these players, as well as the values apparent in or implied by their belief statements. Issue analysis provides the learner with a mechanism for making sense of complex social and environmental issues. As such it is a potent organizational tool for the learner.

As was stated earlier, a major purpose of this approach is to help learners develop into autonomous investigators. In order to accomplish this, important skills which learners must developed include: formulating problem statements and questions, identifying sources of information to answer those questions, and designing strategies to obtain that information. Simply put, the learner must become skilled in answering such questions such as: "What do we need to know about this issue?", "Where can we get that information?", and "How can we get it?".

In order to develop these skills, learners are provided with research experiences. Subsequent to learning how to generate research questions, they are taught how to effectively utilize both primary and secondary sources of information in the investigation of issues. Locating and accessing information from appropriate agencies, resource people, and library sources are important aspects of information gathering. Additionally, learners become adept at analyzing information (and information sources) for bias. The ability to compare and contrast discrete pieces of information, and to identify the beliefs and values inherent in each are important and powerful analytic tools. Thus, learners must be given opportunities to develop these skill using a variety of issue-related information sources.

Students also learn that primary information might be gathered through the use of interviews, or through instruments such as surveys, questionnaires, and opinionnaires. In training youngsters to design and administer survey instruments, an application component

is essential. Thus, we cannot simply tell students how to do these things; we must also allow them to become actively involved in the design and administration process. And, following the collection of data pertinent to the research question(s), the interpretation of those data must be attended to. Therefore, youngsters receive instruction and practice in the in generating logical conclusions and inferences, and on making appropriate recommendations based upon the data collected, rather than upon emotions.

Since a major purpose of this approach is to develop autonomous investigators, the writers encourage instructors to permit youngsters at this time to engage in an independent investigation into an issue of their own choosing. Such a thorough investigation is a prerequisite to sound decision making in the environmental realm, and to responsible participation in citizen action related to the remediation of environmental issues. To allow a learner to engage in independent investigation prior to her/his development of these investigative abilities is foolhardy on the part of instructors. On the other hand, to refuse to allow students to investigate an issue at this point will certainly weaken the effectiveness of instruction and the durability of student learning. Thus, it appears that this component is necessary in order to provide students with an opportunity to apply the varied and sophisticated skills which have been taught, thereby reinforcing the acquisition of those skills.

Perhaps more importantly, as the writers have observed on numerous occasions, an autonomous investigation allows students to make an "investment" of her/his talents, interests, and time in a preferred issue. Not only do students become experts regarding that issue, but they also derive a sense of "ownership" toward that issue. This sense of ownership, or feeling of responsibility provides a impetus for action- taking in a positive manner.

Citizen action training, the final component of this skills development approach, seeks to develop individuals who are capable of making wise choices regarding appropriate and effective citizen behavior, and who are willing and able to apply those behaviors responsibly to environmental issue remediation. Thus, learners become familiar with the methods (strategies) of action at their disposal as citizens, and become skilled in the use of these methods. In the United States, those actions include ecomanagement, persuasion, consumer action, political action, and legal action.

Moreover, decision making skills are sharpened as learners evaluate proposed actions with respect to their appropriateness and effectiveness, required resources, and potential consequences (i.e., ecological, economic, political, legal, social, and other cultural consequences). Finally, learners are asked to formulate a plan of action which they might utilize in response to the environmental issue which they have investigated. The instructor is also urged to provide learners with the guidance, support and encouragement they need to implement those action plans.

Thus, in the skill development model, learners develop the abilities to gather and evaluate information about environmental issues, to make sound decisions regarding environmental improvement and issue remediation, and to take action as responsible citizens in helping to resolve environmental issues. This approach, as with most instructional approaches, has a variety of problems and limitations.

Because it is a developmental approach, it requires careful sequencing and sufficient time. For these reasons, it may not easily lend itself to infusion into an existing curriculum. Educators have typically found that an entire eighteen week semester is needed to sufficiently cover the objectives and activities. This model is quite appropriate, however, for use in a teaming approach, where a science teacher, social studies teacher, and/or language arts teacher join forces, sharing the particular subject matter expertise of each. Interestingly, this team approach can shorten considerably the time needed for this model.

Further, the careful selection of classroom instruction and management techniques is critical when students are actually investigating a large number of different issues. Often, the instructor must act as facilitator between a variety of resources and the many students in the process of investigating issues. In particular, some instructors have found it difficult to make the transition from direct instruction to a role which demands advising and consulting. Allowing students to independently investigate environmental issues is sometimes viewed by teachers as an unfamiliar and threatening departure from "traditional" classroom instruction and management techniques.

At least one issue investigation/evaluation skill methodology for use at the middle level has been formalized and published; i.e., Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules, (Hungerford, Litherland, et al., 1988). This program has been developed and refined over a sixteen year period, and consists of a series of six modules. The modules are interdisciplinary in nature, and emphasize the knowledge and skills subsumed under levels II, III, and IV of the Issue Instruction framework.

Research conducted on the issue investigation approach indicates that it serves as a powerful vehicle for the identification, investigation, evaluation, and remediation of a multitude of environmental issues by students throughout the middle level (e.g., Klingler, 1980: Ramsey, et al., 1981; Volk & Hungerford, 1981; Ramsey, 1987; Holt, 1988;). What follows on the next two pages is an abbreviated sequence of behaviors expected of the students involved in this programme. All activities have proven themselves to be important, but those which are most critical appear in bold type.

Issue Investigation/Evaluation Skills Programme:
Activities and Expected Outcomes

In Module I: At the completion of instructional activities, the student will be able to ...

1. ... describe how human activities impact upon the environment;

2. ... explain how a lessening of the quality of the environment eventually lessens the quality of human life;

3. ... explain how a person's beliefs influence her/his position on an issue;

4. ... explain why a particular environmental situation may be termed an "issue";

5. ... **analyze environmental issues, and identify the "players", the beliefs, and the values associated with that issue; and**

6. ... explain why it is difficult to resolve an environmental issue when there are strong, polarized positions surrounding it.

In Module II: At the completion of instructional activities, the student will be able to ...

7. ... **after reading a description of an environmental issue, draft problem questions that apply to that situation;**

8. ... compare two information sources about an important issue, identify data in each (information, beliefs, value positions), and communicate how these data differ;

9. ... identify private organizations and government agencies that can be contacted for specific information about an environmental issue;

10. ... write an appropriate sample letter to an agency asking for information about a particular issue;

11. ... read two environmental news articles, and state at least two differing value positions expressed in each;

12. ... select an environmental issue, locate three good references concerning this issue, and list these using an appropriate reference/bibliographic format; and

13. ... correctly use the card catalog and The Reader's Guide to locate secondary sources of information about various issues.

In Module III: At the completion of instructional activities, the student will be able to ...

14. ... name issues which lend themselves to information gathering using surveys, questionnaires, and opinionnaires;

15. ... identify, from a list of research questions, those questions that would have to be answered primarily with either surveys, questionnaires, or opinionnaires;

16. ... identify an issue of local/regional concern, and make a list of the information one should collect in an investigation of that issue; and

17. ... **plan for and conduct a primary investigation (research study) which focuses on the use of a survey, questionnaire, or opinionnaire.**

In Module IV: At the completion of instructional activities, the student will be able to ...

18. ... define "conclusion", "inference", and "recommendation";

19. ... distinguish between a conclusion and an inference;

20. ... evaluate conclusions based on associated observations;

21. ... write conclusions and inferences for everyday observations;

22. ... **write conclusions, inferences, and recommendations for a given set of environmental data; and**

23. ... revise a recommendation (if necessary) on the basis of new information.

In Module V: At the completion of instructional activities, the student will be able to ...

24. ... **conduct an autonomous investigation of an environmental issue of the student's own choosing (and approved by the instructor) and report on that investigation to the peer group.**

In Module VI: At the completion of instructional activities, the student will be able to ...

25. ... define each of the following categories of action strategies: "persuasion", "consumer action", "eco-management", "political action", and "legal action";

26. ... identify strengths of group action which are not commonly associated with individual action;

27. ... referring to a specific environmental action designed to help resolve a particular issue, apply the criteria against which the action should be evaluated; and

28. ... **apply all of the action skills and issue knowledge acquired in developing an "action plan" for helping to resolve a specific environmental issue.**

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. . . . we must take advantage of the neglected opportunity provided by the fascinating period of early adolescence, ages 10-15 years. This is a time not only of inordinate vulnerability, but also of great responsiveness to environmental challenge. So it provides an exceptional chance for constructive interventions that can have lifelong influence. . . . The challenge for educational . . . institutions is thus to help provide the building blocks of adolescent development and preparation for adult life.

Turning Points. Carnegie Council on Adolescent Development, 1989

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Comparing the Case Study and Investigation Skills Approaches

Both the case study and the investigation skills approach provide instructional strategies which allow teachers and students to effectively deal with the levels (goals) of issue instruction, and particularly with issue investigation. Both approaches share similar instructional contents and activities, but differ significantly in scope, teacher and student postures, instructional time demands, and a variety of other curricular and classroom management factors. The chart below compares the issue case study and issue investigation skill approaches across a number of educational characteristics.

Comparison Chart: The Case Study vs. the Issue Investigation Skills Approach

Characteristic	Case Study	Issue Investigation
Student Characteristics:		
1. Grade Levels	Recommended Gr. 4-12	Recommended Gr. 6-12
2. Student Role	A receiver of information group member/researcher	An autonomous, independent researcher; skilled in citizenship action strategies
3. Ability Levels	Wide range of abilities	Wide range of abilities
4. Sense of "Issue Ownership"	Not necessarily developed	Typically, students develop a strong sense of ownership
Instructional Characteristics:		
1. Issue Focus	Single issue treatment; issues usually chosen by the instructor	Multiple issue treatment; issues chosen by the individual students
2. Instructor's Posture	At first, very traditional; subsequently as consultant/ facilitator during class investigation	Traditional posture followed by role as consultant/facilitator as students investigate numerous issues
3. Time Demands	Variable, depends upon the case study and the methods involved (2-6 weeks)	Typically, 18 weeks, with one hour per day of instruction at the middle level (less at the college level)

4. Risk of Having a Syntax Problem	High risk	Low risk
5. Inservice Need	High need for training	Very high training need
6. Potential for Infusion into Existing Courses and Programmes	Very high potential	Moderate potential, requires a separate time block
7. Team Teaching Potential	Moderate Potential	Very High Potential
Instructional Outcomes:		
1. Knowledge of a Broad Range of Environmental Issues	Low	High
2. Indepth Knowledge of One Issue	High	Low-moderate
3. Process (Skill) Acquisition	Low-moderate	Very High
4. Skill in Citizenship Action	Typically, issue specific	A generic set of strategies with high transfer potential
5. Citizenship Behavior (Out-of-School Behavior)	Moderate behavior observed if instructor covers the strategies and skills	Typically, a great deal of out-of-school behavior observed
Materials		
1. Source of Materials	Teacher constructed, except for print, audio-visual materials, speakers; Several published case studies are available	Published materials are available
2. Expense	Relatively low for teacher constructed/gathered materials; Moderate for published materials	Moderate if published materials are given to each student

Role-Playing and Simulations. One valuable instructional strategy which may be used effectively within either the broader case study or investigation skills approach is the simulation. There are many kinds of simulations in use in educational circles, such as simulation games, computer simulations, socio-dramas such as "mock hearings" or "mock trials" (Stadsklev, 1975; Horn & Cleaves, 1980;). Those of greatest interest here are socio-dramas, as these will usually involve students in role playing situations. Of particular interest here are environmental issue-oriented and action-oriented socio-dramas, since these provide opportunities for individuals to explore the various players, positions, beliefs, and values present in discrete environmental issues. Because role playing is well adapted for use at the middle level, it will be described in some detail.

Socio-drama role playing permits the learner to "get inside" the issue as he or she "steps inside" the role of a particular player and interacts with other players as they discuss and attempt to resolve an issue. Although it requires some skill on the part of the instructor, this model has great potential for demonstrating the relevance of print information (e.g., from textbooks, articles, information packets, etc.) to real-life experiences. Role playing often provides students with practice in analyzing and responding to differing/multiple views, in making collective decisions, and in developing issue-related human relations skills. This type of socio-drama is probably an ideal activity for young adolescents, as it permits them to "try out" alternative beliefs and values, and thus, to become aware of, inspect, clarify, modify and even validate their own beliefs and values.

Role playing can be conducted using either small or large groups. In the small group procedure, most of the class members will observe members of the small group in a role play. The participation of class members often occurs after the role players have made a decision (or reached a critical point in the scenario), if time is set aside for discussion and comment. Often non-participating students are eager to discuss the postures and decisions of the players, even if they lack the confidence to fully engage in role playing themselves. For these individuals, the opportunity to observe and discuss exposes them to some role modeling, and thus, provides them with some vicarious experiences. As their experience and confidence grows, these students may choose to participate in future role playing situations.

Large group socio-dramas, of course have the advantage of full involvement by all class members. Socio-dramas set in general meetings and hearings, such as town meetings, commission, and public hearings necessitate the involvement of class members in a variety of principal and supporting roles. An example of this large group socio-drama can be found in Wilke, Peyton, and Hungerford (1980). It is entitled "The President's Commission on Population", and simulates a meeting of a presidential advisory commission on population policy. It includes the roles of principal players who will testify before the commission (e.g., an economist, agriculturalist, Planned Parenthood representative, environmentalist, etc.), as well as the commission members themselves, who must reach a decision pertaining to the recommendation of a population policy.

Generally, this type of simulation includes the assignment (or selection) of roles, and requires both background research and preparation on the part of class members for those roles. The instructor should also provide a full outline of each player's role/position, if possible. Otherwise, students might discuss what they feel the instructor thinks is important, rather than make use of their own research. On the other hand, students should understand in advance that role playing is no joke, that there will always be a specific agenda, and that a timetable will be strictly adhered to. This should help keep students on task. They should be assured in advance that once the role playing session is underway,

no breaking of the roles will be tolerated. The instructor, of course, must also resist the temptation to step out of role. In general, the breaking of role is time-wasting.

When describing a socio-drama simulation, the instructor should be very clear about the decision(s) to be made. The nature of the decision(s) will cue students as to the kinds of information they should gather and prepare. Students should be advised to consider which alternatives decisions are possible (i.e., can be reached). They should keep these alternatives in mind as they consider the role they will play, and use this to organize their information, beliefs, personal values, and so on. Of course they should also keep the alternatives in mind during the course of the simulation, as simulation events may narrow the range of alternatives.

As in large group activities, some students might be tempted to remain in an anonymous, non-participatory role. Rubenstein and Slife (1987) recommend the following approaches to instructors to facilitate equitable participation during socio-drama simulations and during the class discussions which follow those simulations:

> 1. When a participant speaks in a weak voice as though the comment or question is meant only for you, resist the temptation to get closer. Walk away, preferably putting other participants between you and the speaker, requiring raised speech volume and interaction within the group.
>
> 2. Be as mobile within the meeting room as possible. Mentally mark off the room into four quarters. After each contribution, turn to a different quarter of the room expectantly. Be prepared for an occasional elongated silence. Let it develop, unless there is a need to clarify the last remark.
>
> 3. Be as sensitive as possible to the need for an occasional question or statement from you to quiet mounting anxieties, or to explain or intensify someone's comments. Playing "devil's advocate" is often very productive, if done gracefully.
>
> 4. Limit your own contribution to that of management. Give participants no hint of what you think concerning proper values or correct decisions. Students should always be convinced that decisions are theirs to make (Rubenstein & Slife, 1987, p. 22).

Panel Discussions and Debates. Like simulations, panel discussions and debates can serve as effective instructional strategies for use in both case study and investigation skill settings. Panel discussions and debates on environmental issues are excellent mechanisms for permitting students to present conflicting viewpoints, and to evaluate the relative merits of differing beliefs and values. In examining and evaluating various positions and viewpoints (ideologies), adolescents are afforded an excellent opportunity to compare their personal views to those of others. In this way, panel discussions and debates are noticeably similar to socio-drama simulations. However, simulations and panels/debates differ in terms of the roles students assume, as well as the content and structure of the activity. Simply put, while panels and debates can be run like simulations, it is not necessary that students assume and limit their views to those espoused by the "player" they are assigned to role play.

Panel discussions and debates can directly involve from two to ten students in active discussion, and can indirectly involve the entire class. Given this, it is generally a good idea to plan a series of panel discussions on a variety of environmental issues for a

middle level class. Students can then select an issue of interest to them, and elect to participate as panelists in discussing that particular issue. If an instructor wishes to plan a series of panel discussions, it is her/his responsibility to identify the major environmental issues to be considered, and to prepare an issue statement for each. In debates it is best if this statement is posed in an affirmative and conclusive manner similar to a hypothesis. In panels, this issue statement should be stated in question form.

The instructor should see that articles and written information on each of the issues are collected, and that the major players/positions involved in each issue are well represented in these print materials. Instructors will most likely assume these responsibilities if a panel discussion is used within the context of case study. On the other hand, instructors using the investigation skill development approach are more likely to allow mature groups of students to propose or select issues, generate the issue question for the panelists to consider, and/or engage in the collection of print materials, since these activities are entirely consistent with the objectives of that approach.

Student preparation for a panel discussion should begin several weeks before it is to held. After the students select or are assigned to particular issue/topic, they should become acquainted with the materials related to their issue which are available (i.e., in the instructor's file, or which they will gather). In either case, students should be encouraged to seek additional information which might be useful in discussing the issue. A week before the scheduled panel discussion, the students participating in the panel should be divided into two or more groups (i.e., enough groups to represent the major players involved in that issue). Thus, while students will not know their "position" well in advance, they can still prepare for their part in the panel by surveying materials which convey their position, as well as similar and opposing viewpoints. Once positions have been selected/assigned, the students representing that position must work together on their presentation of that position.

The Debate. The debate provides a formal procedure for discussing issues, and is probably quite appropriate for the older midle school students. Debates require that students synthesize what they have learned to date, research the player/position they will represent, and develop/present a well-constructed argument before the instructor and the class. As in real life, these positions may make use of several types of statements (or propositions), such as factual assertions, value-oriented appeals, and policy recommendations. Rubenstein and Slife (1987) suggest that debates, whether formal or informal, begin with a proposed solution to a problem (or issue). Debates then proceed with a series of carefully prepared and timed spoken arguments which are altered between speakers taking one position and speakers taking an opposing position. While debates can get rather sophisticated (e.g., by including cross-examination by opposing debaters), it is recommended that initial debates follow the rather simple format presented on the following page (adapted from Rubenstein & Slife, 1987, pp. 24-26; and Gallagher, 1987, pp. 26-28).

Given the debate scenario, students must assume a number of roles prior to and during the debate. They must research their own and the other team's position, as well as prepare for each of the phases of debate outlined above. In addition, teams may wish to include "fielders" who monitor the presentations of their own position, and who should be prepared to respond to questions about their positions.

As noted, students not participating directly in a particular debate should be provided with opportunities to participate in the debate. For example, at any time during the debate, they may ask for clarification of the person speaking if a point is not clear. They

Outline of a Traditional Debate Format

Phase	Position/Team	Role	Statements
A. Constructive Speeches	Position A	Stater	Summarizes Opening Points
	Position B	Stater	Summarizes Counterpoints
	Position A	Prover	Presents Supporting Evidence
	Position B	Prover	Presents Contrary Evidence
B. Rebuttal Speeches	Position A	Attacker	Rebuts Position B
	Position B	Attacker	Rebuts Position A
	(Optional second round of rebuttals for each position)		
C. Closing Speeches	Position A	Stater	Salvages/Summarizes Position A
	Position B	Stater	Salvages/Summarizes Position B

may also be permitted to ask questions during the rebuttal and closing phases of the debate, although this role should primarily be the responsibility of the team members participating in the debate. After the closing statements, the observing students may also be asked to evaluate the presentations of the positions in the debate. And, of course, the should be encouraged to engage in a discussion of the substance and process of the debate after it has been formally concluded.

The Panel Discussion. The panel discussion itself consists of four phases: (a) presentation of positions; (b) clarification of positions; (c) free-form discussion; and (d) audience participation. While it will be important to keep students' first panel discussion or two simple (i.e., in the order presented above), the instructor may wish to modify this sequence to fit her/his purposes. In all cases, it is necessary to communicate to everyone in advance exactly how this panel discussion will proceed. Each phase has a particular purpose and several important structural characteristics.

Presentation of Positions. The purpose of this phase is to provide the audience (the rest of the class) with a general introduction to the issue, and to offer the major rationales or supporting statements which accompany each position. Panelists on each team should outline beforehand the major points they wish to make so that they can accomplish this using clear and complete statements. Participants from each team alternate presentations, with the first presenter from each team having the responsibility of providing a general introduction to and overview of their position. Subsequent presenters on that team should be prepared to "flesh out" that position. It is advised that individual presentations begin with a concise statement of the points to be made by the presenter, and end with a brief summary in support of those points. Approximately one-third of a class period (15-20 minutes) is usually sufficient for this phase.

Clarification of Positions. This phase is actually a question and answer session between the two teams. It allows each team to clarify its own position(s), as well as the position(s) and arguments of other teams.

Only questions of clarification, not rebuttal or discussion, are permitted during this phase. Customarily, this phase is rather short (5-10 minutes).

Free-Form Discussion. The first two phases should have "warmed up" the panelists for free-form discussion. Points, counterpoints, rebuttals, and general discussion are all appropriate. Panelists should be instructed to focus on the primary points of agreement and disagreement. To some degree, team members can prepare for this phase in advance by identifying the main points (and supporting arguments) they wish to emphasize. Team members should also take careful notes during the other teams' presentations during the preceding phases. This discussion phase is the major phase, with about one-half of the total class period allotted to it (25-35 minutes).

Audience Participation. In this final phase, the audience simply poses questions to the panelists. It is advisable that questions be addressed to specific panelists, rather than to the entire group. This is simply because questions asked of the entire group, or of an entire team are usually answered by the most vocal member(s), rather than by the individual who made the pertinent comment. As many different questions and comments as possible should be encouraged from the audience, and a free dialogue should be permitted. This phase may be continued as long as available time and interest dictate.

Developing Skills and Experience in Citizenship Responsibility

A Recap of the Skills Development Approach

Citizenship responsibility is the most important aim and outcome of environmental education, particularly when one considers the array of unresolved and pressing environmental issues learners will encounter throughout their lives. The assumption of responsibility, and the ongoing behavioral involvement in activities designed to remediate issues is not something that happens overnight. Learners develop these characteristics over time. For this reason, the goals presented in this document attend to citizen responsibility in a developmental fashion. In Level II, learners become aware of the need for action to remediate issues and of the various alternatives for this. In Level III, they develop the ability to identify, analyze and evaluate alternative solutions. And in Level IV, learners are provided with instruction on the various types of strategies for, levels of, methods of planning for, and criteria for evaluating actions.

As described in Part I, a modest amount is known about the variables which seem to contribute to the development of these characteristics. For example, it is known that the older "knowledge-attitude-behavior" model is neither accurate nor adequate for the task. The assumptions that information will contribute to knowledge, that this knowledge will positively influence attitudes, and that these positive attitudes will in turn prompt behavior are consistently not borne out by research (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1977; Hines, et al., 1986/87; Marcinkowski, 1988). The relationships among these three variables are far more complex and are less stable than previously thought.

The research literature also indicates that a host of other variables have been found to influence or contribute to these citizenship characteristics (Sia, et al., 1985/86; Hines, et al., 1986/87; Ramsey, 1987; Marcinkowski, 1988). Several of the more important vari-

ables were either identified and described in Part I (e.g., environmental sensitivity, locus of control), or have been highlighted in the discussion of the issue instruction approaches (e.g., knowledge of and skill in using action strategies). These sections also included discussions of instructional methods and resources which have proven useful in fostering the development of these characteristics in learners. Interested readers are referred back to those discussions, as they will not be repeated here.

Other Models of Instruction in Citizenship Participation

Of the instructional methods outlined in the methods chart presented at the outset of this section, the only one which has not yet been described was entitled "Action Learning in the Community". There have been many advocates of action learning in the U.S., from Dewey (1938) through Newmann (Newmann, 1975; Newmann, Bertocci, & Landsness, 1977). Contemporary advocates also use the labels "social learning" and "experiential learning/education" to refer to strategies in this vein. While the modes of student-community involvement are varied, the rationales for such involvement seem to have remained relatively stable.

> [For students] these roles may range from performing public service activities to direct participation in social action activities. The rationale for such programs argues that through such involvement and subsequent reflection on the experience, students will develop positive attitudes about civic and political involvement, acquire relevant interpersonal, intellectual, and political skills, and become more active and effective participants in civic life. Thus these programs attempt to shape student attitudes, values and behavior by breaking down the walls that separate students from adult society. (Leming, 1985)

Research in this arena has found action learning in the community to be a useful educational strategy. Students have been consistently found to expand their sense of self-esteem, sense of efficacy and feelings of competence, and sense of personal and community responsibility, as well as evidence positive shifts in moral reasoning and in attitudes toward adults (Newmann & Rutter, 1983; Leming, 1985). In addition, students generally develop knowledge and skill in group organization and interpersonal skill (Caduto, 1983). While these findings are indicative of the educational value of such experiences, these results emerge when certain programme features are attended to. Even so, it is unfortunate that researchers have rarely investigated the effects of such experience on autonomous/ ongoing civic and citizenship behavior.

In the environmental arena, the most visible advocates of action learning have been Stapp and University of Michigan faculty/students (Stapp, Cox, Zeph, & Zimbelman, 1983; Bull, Cromwell, Cwikiel, DiChiro, Guarino, Rathje, Stapp, Walls, & Youngquist, 1988), Hungerford and Southern Illinois University faculty/students (Hungerford, Litherland, Peyton, Ramsey, & Volk, 1988), and writers in the area of "environmental values education" (Caduto, 1983, 1985; Knapp, 1983). The University of Michigan model is entitled "Action Research: Community Problem Solving" (AR:CPS), and represents an attempt to blend students' involvement in action research with their active involvement in solving real-world problems. While the syntax of activities differs from the case study and issue investigation/evaluation skill development approaches presented in this document, it would appear that it emphasizes many of the same skills as those approaches.

The curriculum development efforts of Newmann, et al., and Stapp, et al., clearly indicate that action learning opportunities are best considered as a part of larger curriculum,

and within the context of school-community relations. For example, Newmann's foundational work (1975) undergirds the secondary program outlined by Newmann, Bertocci, and Landsness. The areas of competence and concern this program seeks to address include: (a) the formulation of policy goals (e.g., social and moral deliberation); (b) the resolution of psycho-philosophic concerns about community action (e.g., integrity, openness, motives, justifications, and uses of power); and (c) the efforts to support one's goals (e.g., groups process and organizational management, knowledge of political and legal realities, and advocacy strategies). The resulting secondary program includes six courses over two semester:

SEMESTER ONE	SEMESTER TWO
Political-Legal Process Course	Action in Literature Project
Communications Course	Public Message
Community Service Internship	Citizen Action Project

These curricular outlines reiterate the importance of helping students adequately prepare for action learning opportunities in the community. They also begin to point out concerns which should be attended to prior to having students involved in action learning in the community. Guidelines derived from the work of Newmann (1975) and Bull et al. (1988) would include, but not be limited to, the following.

Instructors should be ...

a. ... generally familiar with community organizations and resource persons involved in discrete environmental issues;
b. ... aware of the posture of the community and various "players" on issues of interest to learners;
c. ... familiar with the postures of school officials (administrators and board members) toward community projects, the issues of interest, and student action on those issues; and
d. ... continually aware of students' plans, activities, and concerns.

Learners should be:

a. ... sensitive to the cultural circumstances, beliefs and values and capabilities they carry into the community and bring to this project;
b. ... aware of the values and skills of other team members;
c. ... sensitive to the beliefs and values of community members; and
d. ... willing to communicate clearly and work cooperatively with their instructor, members of the team, and members of the community.

When adequate attention is paid to the curricular, instructional, political and logistical preparation for action learning in the community, such experiences can serve as valuable learning experiences for middle level students.

PART V

EXAMPLE ACTIVITIES FOR COURSES WITHIN THE SPECIALIZATION

Introduction

The major purpose of this document is to demonstrate the viability of offering a Specialization in Environmental Education (SEE) as a part of a professional preservice middle level teacher education programme (TEP) which will produce teachers who are competent to teach for the critical goals in environmental education (EE), as well as for the more traditional goals associated with middle level programmes. Part III presents one design for such Specialization. In that SEE, EE goals and objectives were built into the overall TEP by modifying ("infusion" courses) and by adding ("core" courses) to existing TEP coursework . In Part V, professional educators can review three (3) selected activities which are designed to be used in three of the types of courses within the specialization; i.e., "core" methods courses, and "infusion" content and methods courses. What the "infusion" course activities attempt to demonstrate is the ease with which the overall infusion process can be accomplished.

Regardless of which activity one reviews, it should be remembered that these are only example activities. While an effort has been made to present well developed activities, there is no accompanying mandate to use them as presented. The authors recognize that segments of any activity may need to be modified to fit the teaching/learning setting in which they are to be used. While decisions about which activities to use in TEP/SEE courses reside with programme coordinators and instructors, it should be noted that these three example activities have been carefully selected and developed. For reasons discussed in Parts I and III, the example activity designed to be used in the "infusion" content course tends to reflect higher goal levels and an appropriate method for teaching to those goals in middle level settings. Similarly, the two example activities for use in methods courses tend to reflect the use of those EE goals in planning for instruction. Given this, professionals are encouraged to carefully consider the educational value and the potential uses of these example activities within TEP/SEE courses.

While it is apparent that the number of activities presented here in Part V only reflect the beginning of an attempt to create activities for TEP/SEE courses, interested readers should recognize and seek to make use of other resources. For example, they should also recognize that the activity outlines and worksheets presented in Part IV can easily be developed for use in TEP/SEE "core" courses. In this context, the "The Ecosystem Observation Activity" could easily serve as the basis for one or more field activities in the Ecology course. Similarly, "The Garbage Dump Field Trip Worksheet" and the Solid Waste Case Study Outline could be adapted for use in the Environmental Health course. Finally, the worksheets associated with the inventorying and use of community resources could serve as the basis for activities or projects in any of the three methods courses. Beyond this, interested readers are referred to the nine (9) example activities presented in Hungerford, Volk, Dixon, et al. (1988), as each of those activities could also be used very effectively in one or another of the courses in this TEP/SEE. In fact, an effort has been made to avoid duplicating activities presented in that 1988 volume for just this reason.

With this introduction, readers and users should have gained some insights into the use of these and other example activities. As a final assist, readers and users may find it useful to know that each activity generally follows the same format. This format includes the following components:

1. Infusion Activity for (The Course Title)
2. The Activity Title
3. Environmental Education Goal Level(s) and Goal(s)
4. Course Prerequisites to the Activity
5. Purposes of the Activity
6. Key Objectives for the Activity
7. (As Necessary) Background Information
8. The Structure of the Activity
9. Statement To the Student
10. Worksheet(s)
11. (As Appropriate) Synthesis or Summary

Additional notes of explanation are provided where they seem particularly pertinent or necessary.

Example Activity for Core Courses

One activity is presented here for use in core courses within the TEP/SEE. This particular activity is designed for use in the Foundations of Environmental Education course, and emphasizes students' use of the EE goals to analyze curricular materials. Other example activities or activity outlines appropriate for use in core courses can be found in Part IV of this document.

Core Activity for: Foundations in Environmental Education

Activity: The Analysis of Curricular Materials

GOAL: Goal Level V: The Instructional Application Level: 21.... demonstrate the ability to both select and develop curricular/ instructional materials which address each of the four EE goal levels, and which are appropriate for use in middle school settings.

PREREQUISITES: Prior to enrolling in this course, students should have completed the core ecology and environmental courses. Prior to engaging in this activity, students should have completed study in course topics through "EE Resources and Curricular Materials", with instructional emphasis upon types of curricular materials, and the evaluation of the potential educational uses and benefits of resources and curricular materials.

PURPOSE: This activity allows TEP/SEE faculty to evaluate the ability of preservice teachers to apply their knowledge of the goals of EE to the process of selecting curricular materials. As students, they will be asked to respond to three sets of curriculum evaluation items. These sets of items focus upon: (1) the type and potential use(s) of the materials; (2) the extent to which the materials emphasize EE goals; and (3) selected aspect of teacher and student use(s) of the materials. There are many potential benefits of helping teachers develop skill in the analyses of EE materials at the preservice level. They will have

the opportunity to become familiar with the layout of various materials and to develop insights into the selection of materials. One important insight is that few, if any EE materials cover the full range of EE goals, and so, in order to address the full range of goals, materials must be judiciously mixed and matched. Ultimately, such skills and insights should serve them well in their middle level teaching practice.

SAMPLE OBJECTIVES: Upon completion of the curriculum analysis activity, learners will be expected to be able to ...

1. ... identify various EE curricular materials which are available for middle level teachers' use. [The range of materials which students should be familiar with and able to identify depends upon the status of EE curriculum development with the nation, region, and/or locality.]

2. ... classify various curricular materials by type after having briefly reviewed their scope and organization.

3. ... describe several alternatives ways of using the differing types of curricular materials within a programme or course.

4. ... conduct a fair and thorough analysis of the extent to which a given set of curricular materials addresses goals within each EE goal level, and record the results of that analysis in a clear manner.

5. ... draw conclusions about the extent to which a given set of curriculum materials addresses goals within each EE goal level on the basis of data collected during an analysis of those materials.

6. ... identify five (5) criteria which middle level teachers should consider when assessing the usability of a given set of curricular materials.

7. ... conduct a fair and thorough analysis of a given set of curricular materials using selected criteria related to middle level, school, teacher, and student use of those materials.

8. ... draw conclusions about the extent to which a given set of curricular materials can be considered appropriate for use in their middle level classroom(s).

BACKGROUND FOR THE INSTRUCTOR: The identification, analysis, and selection of curricular materials can be a difficult professional endeavor for any number of reasons. First, course instructors and/or students may encounter barriers in the identification and accessing of appropriate curricular materials. Without access to materials, analysis becomes problematic, if not impossible. Second, there are a number of differing types of curriculum materials commonly used in EE programmes (e.g., standard and infusion textbooks, modular units, basic and extended case studies, and activity manuals). It may not be possible to analyze these in the same manner, and even if one could, it may be difficult to compare the results of the analysis of differing types of materials. Third, a careful analysis of materials will usually require clear, practical and easy to use curriculum analysis or evaluation forms. In many cases, these can be adapted from existing forms. For example, the forms used in this activity have been adapted from the work of Hungerford and Tomera (1985), Stevenson (1986) and Gardella (1987). Still, it may be necessary to develop differing versions of one form for use in analyzing each of the differing types of materials. Fourth, if students have not been involved in the development of such forms, they will need to be trained to use them properly. For example, if students wish to review

a sample of the manual's activities, they will need guidance in the use of proper sampling procedures.

Finally, in the course or curriculum analysis, students will often be asked to make judgements due to inherent ambiguities in the analysis process. While this can and should be minimized, it can never be eliminated. For this reason, there should be some mechanism for students to make note of and discuss ambiguities with the course instructor and with other students (i.e., particularly those engaged in the same task). Such discussions serve as a very important part of the learning process, and so, opportunities and encouragement should be provided.

It is also advisable that students be required to write up and to report on their procedures, results, and the implication of those results. Any summative discussion among the students should focus upon the practical conduct and uses of such an analysis. In this regard, the instructor should pose probing questions to help students focus their attention on practical matters. For example, do the results of the analyses clearly point toward the selection of one particular set of materials over another? If so, is that set of materials in need of supplementation? Or, do the results indicate a need to "mix and match" materials so that all goal levels can be addressed? Finally, do the collective results indicate a lack of materials for addressing a particular goal level, and so, point out the need for additional curriculum development efforts?

STRUCTURE OF THE ACTIVITY: In preparation for this activity, the instructor and students will need to collect available curricular materials for analysis purposes, as well as prepare the analysis instrument(s) to be used. The instructor should also decide whether to assign particular sets of curricular materials to students, or to allow students to select their own. In any event, it is advisable that several students analyze the same set of materials in order to facilitate discussion over the process and the results. The instructor should also be prepared to describe how the analysis procedures, results, and implications should be reported - in both written and spoken form. There may be extensive discussion about the implications of the analysis process as a whole, as well as of their findings. The instructor should be prepared to raise probing questions of students in this regard (see "Background for the Instructor").

TO THE STUDENT: This activity is designed to provide you with an opportunity to apply what you have learned about the goals of environmental education (EE), about EE-related curricular materials available for use in your teaching, and about middle level education. Whether you are assigned or are given the opportunity to choose a particular set of curricular materials to analyze, you should find this a useful experience, since, at some point, you will probably be responsible for at least supplementing - if not selecting - the curricular materials you wish to use in your own classroom. There are basically three parts to this analysis; each having a differing role in helping you assess the overall quality and usability of the materials. You should be prepared to help modify the analysis instrument you will use, as well write up and report on your analysis to the class when you're finished.

WORKSHEETS: Sample curriculum analysis forms have been designed to assist in the analysis of the: (A) type, (B) EE goal coverage, and (C) middle level uses of a select set of materials. Section B (goals) may be extended to include the goals presented in Part I of this document if users find it too vague and difficult to use. Nonetheless, the authors have developed it so that it is both reflective of and easier to use than the full set of goals. Readers are encouraged to modify Section C such that it reflects those concerns (i.e. in the form of analysis criteria) which are of interest and importance in the selection of EE materials.

THE ANALYSIS OF ENVIRONMENTAL EDUCATION CURRICULUM MATERIALS

PART A. General Characteristics of the Materials

1. Type of Curricular Material: _____ Textbook _____ Modular Units

_____ Basic Case Study _____ Extended Case Study _____ Activity Manual

_____ Other; Please Describe: _____

2. Common Use(s) of these Materials in Middle Level Settings: _____

_____

_____

_____

3. Other Potential Use(s) of these Materials in Middle Level Settings:

_____

_____

_____

_____

4. Will the material's Type and/or Use(s) have any effect upon how an analysis is conducted? _____ Yes _____ No. Why? _____

_____

_____

PART B. The Material's Coverage of EE Goals

GOAL LEVEL I. ECOLOGICAL FOUNDATIONS: Indicate how well these materials would help students develop the following attributes:

A. knowledge of major ecological concepts, including those focusing on individuals, species populations, communities, ecosystems.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

B. the ability to apply knowledge of ecological concepts to the analysis of environmental problems.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

C. the ability to apply knowledge of ecological concepts in predicting consequences of alternative solutions to environmental problems.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

GOAL LEVEL II. CONCEPTUAL AWARENESS: Indicate how well these materials would help students develop the following attributes:

A. an awareness of the ways cultural activities (e.g., social, economic, religious, political) influence the environment from an ecological perspective.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

B. an awareness of a wide variety of environmental issues, and the ecological and cultural implications of them.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

C. an awareness of the need for and the various alternative solutions available for the remediation of crucial environmental issues.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

GOAL LEVEL III. INVESTIGATION AND EVALUATION SKILLS: Indicate how well these materials would help students develop the following attributes:

A. the ability to identify and investigate environmental issues using both primary and secondary sources of information.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

B. the ability to analyze environmental issues and associated value perspectives for their ecological and cultural implications.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

C. the ability to evaluate alternative solutions for crucial environmental issues with respect to their ecological and cultural implications.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

GOAL LEVEL IV. ENVIRONMENTAL ACTION STRATEGIES AND SKILLS: Indicate how well these materials would help students develop the following attributes:

A. the ability to develop action plans using a variety of citizenship action strategies (e.g., consumer, political and legal action).

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

B. the ability to evaluate action plans in light of their ecological and cultural implications.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

C. the ability to implement action plans and apply action skills for the purpose of resolving environmental issues.

Not At All	Limited	Fairly Well	Very Well
0	1	2	3

PART C. The Materials Appropriateness for and Use at the Middle Level

General Characteristics

1. Are the materials well organized from the standpoint of the teacher (efficient teaching)? Of the student (effective learning)?

2. Does the material clearly communicate goals/objectives to the teacher? To the student?

3. Does the material consistently provide accurate information?

4. Does the material provide a list of supplementary resources for the teacher (e.g, reference books and articles)? For the student (e.g., films, trade books, computer software)?

5. What are the overall (or per student) costs associated with the use of this material?

6. Is the use of this material acceptable to educational administrators, students' parents, and to the wider community?

Appropriateness for Students

7. Is the reading level of the material appropriate for the middle level students?

8. Is the scope and sequence of content and skills appropriate for middle level students?

9. Does the material provide opportunities for middle level students to actively explore and inquire?

10. Is the material attractive and appealing to middle level students?

Appropriateness for Teachers

11. Does the material provide adequate background information for the teacher?

12. Does the material suggest teaching methodologies to maximize teacher effectiveness?

13. Does the material contain suggestions or mechanisms for evaluation?

14. Will teachers require special background and/or training to use these materials?

Example Activities for Infusion Courses

Two courses have also been developed for use in infusion courses within the TEP/SEE. The first activity emphasizes the development and application of skills associated with the use of secondary sources in the investigation of environmental issues within the Science Processes for Teachers course. The second activity can be used in either of the disciplinary methods courses, since both should contain a cycle of activities which relate to planning for infusion. The former course is used to illustrate skill-oriented infusion, while the latter illustrates how to help teachers plan for content and skill-oriented infusion with respect to their middle level programme and courses.

Infusion Activity for Science Processes for Teachers

Activity: Using A "Card Catalog" in Issue Investigation

GOAL: Goal Level III: The Investigation and Evaluation Level: 12.... apply the knowledge and skills needed to identify and investigate environmental issues (using both primary and secondary sources of information), and to synthesize the data gathered.

PREREQUISITES: Prior to enrolling in this course, students should have completed or be currently enrolled in background coursework in the natural sciences. Prior to engaging in this activity, students should have completed study in course topics through "Issue Investigation Skill Instruction", with particular emphasis upon the use of skills associated with data collection via secondary sources.

PURPOSE: This activity allows TEP/SEE faculty to evaluate the ability of preservice teachers (students) to apply their skill in investigating environmental issues, primarily those involved when using secondary sources of information. The skills which would be called upon in this secondary investigation activity include their ability to: (1) identify and delimit a specific issue topic; (2) conduct a library search for books on that issue topic using a "Card Catalog"; (3) select a minimum of three books and materials which portray differing viewpoints on their issue topic; and (4) prepare a summary of the information and viewpoint(s) presented in each. This activity is seen as the first of four activities in which students are asked to apply secondary issue investigation skills.

SAMPLE OBJECTIVES: Upon completion of this issue investigation activity, learners will be expected to be able to ...

1. ... identify an environmental issue which is amenable to investigation using secondary sources of information.

2. ... set limits on the scope of the investigation of that environmental issue, and identify the primary issue topic to be investigated.

3. ... search a Card Catalog by subject (topic), by author, and by title.

4. ... locate Card Catalog references for the issue topic under investigation.

5. ... use information presented in the Card Catalog to locate books and materials on the issue topic under investigation on the library shelves.

6. ... select a minimum of three (3) library books/materials which present differing viewpoints on the issue topic under investigation.

7. ... develop a one-to-two page summary of the information and viewpoints on the issue topic in each of the selected books/ materials.

BACKGROUND FOR THE INSTRUCTOR: Students should receive training in the use of those issue investigation skills which are needed in both primary and secondary investigations, such as the ability to identify a discrete environmental issue which is amenable to investigation, and to set some boundaries on the scope of an investigation of that issue. Without careful attention here, students are likely to get bogged down in their attempts at autonomous issue investigation. The instructor may wish to approve the issues and issue topics students select. Once students demonstrate these abilities, they should be receive training in the use of those library resources which can help them access information relevant to a specific issue topic. In most areas of the world, the "Card Catalog" is a standard resource students can use in searching library collections. Usually a catalog search must be done manually, although it is becoming more common to be able to conduct a computer search of the card catalog (i.e., as a database). In any event, a search of this sort will usually begin with a subject (topic) search, and may continue with author and/or title searches for materials relevant to particular issue topics. To help insure that students are selecting relevant books and materials, they should be asked to provide a reference for and a summary of each.

The three subsequent activities which can also be used to provide students with the opportunity to apply secondary investigation skills after they have received appropriate training. These three activities emphasize: (1) conduct a search for and summarize a minimum of three articles on the same issue topic using an index to periodical literature (e.g., in the U.S., The Readers Guide to Periodical Literature); (2) conduct a search for and summarize a minimum of three newspaper articles on the same issue topic using an index to nationally or regionally prominent newspapers (e.g., in the U.S., the index to The New York Times); and (3) prepare a written summary (or outline) of the important information and viewpoints on that issue topic using Card Catalog, periodical literature, and newspaper sources. These three activities, along with the activity outlines here should serve as adequate preparation for students to conduct an autonomous secondary investigation of an issue topic of their choosing.

STRUCTURE OF THE ACTIVITY: In preparation for this activity, the instructor and students should have reviewed a variety of environmental issues, and should have access to a library with a Card Catalog. Both the library and the catalog should contain sufficient information to permit student searches on a variety of environmental issues. As each pair of students prepares for their search, the instructor should provide opportunities for class members to discuss their issue and issue topic with a search in mind. The instructor should also see that students are oriented to the library and the use of the Card Catalog prior to initiating this activity. Finally, the instructor should have prepared worksheets and the assignment sheet for student use during their library visit.

The activity begins with the arrival of instructor and students at the library. With their issue topics in mind, student pairs should begin a search for books and other materials on their issue topic. Once students have identified cards on their topic, they should record relevant information from each card onto the worksheet (see Sample Worksheet). This should help them keep information organized as they prepare to find these materials on the

library shelves. Once located, books and materials should be collected for review by the pair. The review process may take place in or outside the library (e.g., in class or at home). Regardless, students should clearly recognize that their review should provide responses to two important questions: (a) "Is this book/materials clearly related to our issue topic?", and (b) "What kinds of information and which viewpoint(s) does it provide on that issue topic?". With responses to these questions, each pair of students should select three (3) sources which provide differing viewpoints on that issue topic (e.g., authors take differing positions, or survey a range of positions). These are the three sources which students should prepare summaries for (see Sample Summary Sheet).

TO THE STUDENT: This activity is one of four activities designed to help you use library resources as a part of an investigation of an environmental issue of your choosing. You will be working in pairs to select an issue, and then to narrow that issue down so that you can investigate a particular topic (or aspect of that issue). The thrust of this activity is on the use of the Card Catalog in searching for and locating print materials relevant to your issue topic. You will be asked to use the Card Catalog, record information on possible sources of information you find on a worksheet, and select three sources which you feel present differing viewpoints on your issue topic. You will then summarize the major points and viewpoints presented in each of these sources. After this, you should be prepared to discuss your search with other class members, and to present your findings to them.

WORKSHEETS: An abbreviated sample worksheet and summary sheet are provided here for teacher and student use. The sample worksheet is intended to help students in their search of the Card Catalog, library shelves, and located books/materials.

SECONDARY ISSUE INVESTIGATION WORKSHEET:
Card Catalog Sources

Names _____

Issue and Issue Topic _____

Sources Located

1. Call Number: _____

Author(s): _____

Title: _____

Search Decisions: (a) Was it available in the library? ____ Y ____ N

(b) Does it clearly address your issue topic? ____ Y ____ N

(c) Which viewpoint(s) does it present or reflect? _____

_____

_____

2. Call Number: _____

Author(s): _____

Title: _____

Search Decisions: (a) Was it available in the library? ____ Y ____ N

(b) Does it clearly address your issue topic? ____ Y ____ N

(c) Which viewpoint(s) does it present or reflect? _____

_____

_____

3. Call Number: _____

Author(s): _____

Title: _____

Search Decisions: (a) Was it available in the library? ____ Y ____ N

(b) Does it clearly address your issue topic? ____ Y ____ N

(c) Which viewpoint(s) does it present or reflect? _____

_____

_____

NOTE: This worksheet should contain between six and ten spaces for recording information on located sources.

ABBREVIATED SUMMARY SHEET: Card Catalog Sources

Names: _____

Issue and Issue Topic: _____

Reference for This Source _____

_____

_____

_____

Outline of Information and Viewpoints to be Highlighted _____

_____

_____

_____

_____

The Summary

_____

_____

_____

_____

_____

_____

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_____

SYNTHESIS OR SUMMARY: For this particular activity, it is advisable to provide each pair with an opportunity to describe their search and discuss their three sources with other class members. This may help pinpoint differing search strategies, as well as provide students with an initial understanding of a wide variety of issues. With respect to the four activity sequence described under "Background for the Instructor", students are asked to summarize the results of this search and of two other searches relative to their issue topic.

Infusion Activity for Science or Social Studies Methods

Activity: Planning for Infusion

GOAL: Goal Level V: The Instructional Application Level: 22.... demonstrate the ability to organize and implement instruction at each of the four EE goal levels using those teaching strategies which have proven effective, and which are appropriate for use in middle school settings.

PREREQUISITES: Prior to enrolling in this course, students should have completed most environmental, science and social studies content coursework, as well as coursework in Foundations of and Methods in Environmental Education. Prior to engaging in this activity, students should have completed study in course topics through "Environmental Education", with emphasis upon the identification of opportunities and strategies for infusing EE into middle level science/STS or social studies education programmes.

PURPOSE: This activity allows TEP/SEE faculty to evaluate the ability of preservice teachers to apply their skill in infusing EE-related contents and skills into traditional discipline-oriented courses in science or in social studies. The skills which would be called upon in this infusion planning activity include the ability to: (1) demonstrate a familiarity with contents and skills in EE; (2) demonstrate a familiarity with contents and skills emphasized in a discipline area course; (3) recognize areas of possible commonality and/or complementarity between EE and disciplinary contents and skills; (4) demonstrate their ability to identify and make use of basic infusion strategies; and (5) identify the EE goal Level (s) most closely associated with a particular infusion plan.

SAMPLE OBJECTIVES: Upon completion of this infusion planning activity, learners will be expected to be able to ...

1. ... generate a list of the contents (concepts) emphasized in one or more units of a common middle level science or social studies course.

2. ... generate a list of the various types of skills emphasized in one or more units of a common middle level science or social studies course.

3. ... identify a minimum of four (4) basic and discrete infusion strategies.

4. ... identify those disciplinary contents from a list of such contents which are also considered to be contents in EE.

5. ... identify opportunities where disciplinary contents could be illustrated or applied using environmental examples, and provide a rationale for citing these as opportunities.

6. ... identify those science or social studies skills from a list of such skills which are also considered to be skills emphasized in EE.

7. ... identify opportunities where science or social studies skills can be illustrated or applied using environmental examples, and provide a rationale for citing these as opportunities.

8. ... identify opportunities where skills emphasized in EE can be illustrated or applied using science or social studies examples, and provide a rationale for citing these as opportunities.

9. ... prepare a plan for infusing selected EE-related contents and/or skills into a selected middle level science or social studies course using at least one of the basic infusion strategies.

10. ... identify the EE Goal Level and EE Goal(s) which are most clearly addressed within a particular infusion plan.

BACKGROUND FOR THE INSTRUCTOR: There are basically two ways in which EE can be integrated into existing middle level programmes: (a) through the creation of interdisciplinary course offerings which emphasize ecology, environmental issues and/or the resolution of those issues; and (b) through the creation of multi-disciplinary course offerings whereby the contents and skills of EE are infused into existing disciplinary courses (i.e., in this case science or social studies courses). In this activity, students are asked to demonstrate their ability with respect to the latter; i.e., infusion strategies.

The instructor should be prepared to discuss the rationale(s) for infusion, as well as to identify and model several basic infusion strategies at the outset of this activity. A simple matrix, such as the one presented below, can be useful in helping students conceptualize basic infusion strategies. A matrix such as this may also prove useful to instructors who wish to model infusion planning and application efforts associated with each of these basic infusion strategies for their students.

		The Discipline Area Course	
		Contents	Skills
The Field of EE	Contents	A. Matches between disciplinary contents and EE contents (e.g., inclusion of ecological concepts in a biology course) B. Using EE contents as examples or applications of disciplinary contents (e.g., using environmental examples to illustrate the legislative process or social movements)	C. Using EE contents with disciplinary skills (e.g., using ecological examples when teaching scientific data interpretation, or using environmental articles when teaching students to identify bias in written communications)
	Skills	D. Using disciplinary contents with EE skills (e.g., conduct an issue analysis of an STS issue or a social issue of national importance)	E. Matches between disciplinary skills and EE skills (e.g., teaching basic process skills in science, or social/citizenship participation skills in the social studies)

This matrix helps to identify at least five different kinds of basic infusion strategies available to instructors and students. While these serve as "building blocks" for infusion planning, they should not be seen as the only infusion strategies available. For example, there may be other basic strategies, as well as more complex strategies (e.g., combinations of two or more of the basic strategies) available for use. Examples of more complex strategies, such as basic and extended case studies, have been described elsewhere in this document. Regardless, for the purposes of this activity, instructors are encouraged to emphasize the use of basic infusion strategies, as these should provide students with a good initial conception of how to begin the infusion process.

Each of these basic infusion strategies requires that students conduct a careful and thorough identification of the contents (concepts) and skills emphasized in particular units of a middle level science or social studies course. Students should be encouraged to engage in this portion of the activity with a full recognition of its importance. Once the content and skills lists have been prepared, students will be ready to review the lists for infusion opportunities. As the activity objectives imply, students should be encouraged to do more than simply identify infusion opportunities; i.e., they should be asked to explain, defend, or provide examples for the opportunities they identify. This may be done individually with the instructor, in small groups, or before the class. After the infusion analyses have been completed, students will be asked to complete an infusion plan for the unit(s) reviewed. The instructor will need to determine the scope of the plan students will be expected to complete (e.g., from simply identifying where particular contents and/or skills will be infused, to the infusion strategy to be used, to the creation of sample lesson plans for infusion). In addition, the instructor will need to determine how the infusion plans will be presented. If time permits, students should have the opportunity to orally present or discuss the planning process and their plans.

STRUCTURE OF THE ACTIVITY: Prior to initiating this activity, the instructor should have obtained copies of textbooks, course outlines, or other print materials which clearly portray the contents and skills emphasized in a variety of middle level science or social studies courses. The instructor should have also prepared any assignment or worksheets they wish to distribute to students. In doing so, they should keep in mind how students will engage in the various tasks (e.g., alone or in pairs), and present the results of their work (e.g., the format for displaying the results of their analyses and planning efforts). The instructor and students may be referred to the results of infusion analyses presented in Part III of this document, as those charts should serve as useful models for displaying the results of an infusion analysis (i.e., opportunities for infusion).

At the outset of the activity, students should be asked to select the outline materials for one middle level science or social studies course. For their middle level course, students should select a minimum of one unit (or the equivalent of a unit) for analysis. The **first task** students will engage in is the identification and listing of contents and skills emphasized in the unit(s). These lists should be presented in writing as the first part of their infusion plan. The **second task** for infusion planning requires students to identify, communicate and defend opportunities for infusing EE contents and/or skills given their lists. The resulting set of opportunities constitutes the second part of their infusion plan. The **third task** requires that students create a curricular and instructional design for infusion based upon one or more of the opportunities they identify. This serves as the third and final part of their infusion plan. A set of questions which may be used to help develop this third portion of the infusion plan has been included as a "Worksheet."

TO THE STUDENT: This activity should help you better understand the why and the how of infusion planning. Since you may be placed in a middle level teaching position which requires that you teach disciplinary courses (i.e., science or social studies courses), it is necessary for you to consider how you might be able to infuse EE into those courses. This activity is an initial attempt to help you develop the basic strategies and skills to accomplish infusion in your own courses. There are four parts to the activity: (1) the instructor will introduce rationales and basic strategies for infusion; (2) you will select a unit in a middle school course, and identify the primary contents and skills to be taught in that unit; (3) you will then analyze those contents and skills for their infusion potential; and (4) using the results of your analysis, you will begin to design a curricular and instructional plan for one or more of the infusion opportunities you identify. Along the way, you will probably be asked to share your efforts with the instructor or with other members of the

class. Remember, there are few, if any, wrong answers, so don't be afraid to discuss your work!

WORKSHEETS: The following worksheet consists of a set of questions which may be used to help instructors and/or students develop the third part of their infusion plan. Readers are encouraged to modify, add and delete questions based upon their experience and their expectations of preservice teachers.

SELECTED GUIDING QUESTIONS FOR INFUSION PLANNING

1. Does it appear that there are opportunities for EE infusion given the list of unit contents and skills?

2. Which of the basic infusion strategies are available for use given the opportunities for infusion you have identified?

3. Which basic infusion strategy(s) would best fit the course/unit?

4. Which infusion strategy(s) would make the greatest contribution to student learning?

5. How much class time can you make available for these infusion activities?

6. Will the infusion activities emphasize a teacher-centered approach (e.g., where the teacher provides information, examples, etc.) or a student-centered approach (i.e., where students generate possible examples and applications)?

7. Will you need to develop lesson plans for any planned infusion activity?

8. Will you need to develop any materials for instructor or student use as part of any planned infusion activity?

9. Which EE Goal Level(s) and EE Goal(s) are emphasized in the planned infusion activity(s)?

10. How will the planned infusion activity meet these goals without compromising the integrity of the disciplinary goals and objectives (i.e., of the course and/or unit)?

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GLOSSARY OF TERMS

Abiotic: nonliving; an abiotic variable in an ecosystem would be exemplified by such things as light, rain, moisture, heat, bedrock, and topography.

Acid Rain: Rainfall (or fog) which is more acidic than normal, often caused by an infusion of sulfur and nitrogen compounds from vehicular exhausts and coal burning power plants.

Adaptation: a particular attribute which contributes to an organism's survival in a community, e.g., protective coloration.

Advocacy: pleading a cause of another person; the act of advocating; supporting.

Affective: relating to feeling, emotion, or desire.

Ancillary: subordinate; of related but not of primary importance.

Aquifer: a place where water is found within the earth's crust (this water known as ground water).

Autonomous: independent, without outside control, self-regulating.

Behavioral (in an educational context): pertaining to actions of an individual, behaviors; often referred to in education as an action/behavior which is observable, overt.

Belief: that which a person holds to be true.

Biodegradable: any material that can be broken down in the environment by decomposers, e.g., paper products, human sewage, vegetable matter.

Biogeochemical cycles: those chemical cycles that are critical to the maintenance of ecosystems, e.g., nitrogen cycle, calcium cycle.

Biosphere: that relatively thin "shell" surrounding the earth that supports life.

Carnivore: an organism that kills and eats animals, e.g., lion, hawk, owl, snake.

Citizenship action skills: skills related to the actions and behaviors which citizens have at their disposal in working toward the solution of environmental issues.

Cognitive: related to the mental processes by which knowledge is acquired; cognitive may relate to either an individual's knowledge or an individual's ability to process knowledge.

Community: in an ecological sense, an interacting and interdependent set of plants and animals, e.g., a prairie community, a pond community.

Conceptual: relating to mental images held by individuals and associated with events and objects; ideas.

Consumer action: an economic threat by an individual or a group aimed at some form of behavior modification in business or industry, e.g., boycotting, discriminating and conservative use of goods and services.
Criteria: standards; rules by which something is judged or evaluated.

Critical thinking skills: those mental processes which enable a human being to process information in logical ways; cognitive problem solving skills; science and social studies process skills are critical thinking skills.

Demographic: relating to populations and the study of them, e.g., births, deaths, marriages, health, etc.

Desertification: the conversion of a productive ecosystem to desert through overgrazing, prolonged drought, or climatic change; often associated with man's activities.

Didactic approach: an educational (instructional) methodology focusing mainly on a lecture delivery format, deductive in nature; the teacher as the source of knowledge.

Dynamic equilibrium: a tendency toward homeostasis; stability over time with periodic fluctuations.

e.g.: symbol for "for example".

Eco-management: any physical action taken by an individual or a group aimed directly at maintaining or improving the existing ecosystem(s), e.g., reforestation, landscaping, installing bird boxes.

Ecology: the scientific study of the interrelationships that exist between organisms and between organisms and their physical environment.

Ecosystem: an aggregate of plants and animals which are interdependent plus the abiotic variables with which they interact; typically thought of as self-contained in the sense that many of the essentials for life can be cycled and recycled within that system.

Effluent: wastewater from a sewage plant or industry.

Emigration: the movement of members of a population out of one locality into another; usually a permanent move.

Empathy: a feeling for; sympathetic identification with something, such as empathy for an endangered species.

Empirical: based on observation; founded on direct experience or experimentation; scientific.

Empiricism: the mode of thought which is typically scientific in nature, a philosophy focusing on the reality of observation and experience as the basis of truth; scientific method.

"Empowerment": as used in this document, a personal feeling of being in control of a situation, e.g., the individual becomes convinced that he/she is able to effect change with regard to a particular environmental issue.

Energy pyramid: the tendency for usable energy to be lost as it moves through a food chain; often a diagrammatic representation of available energy at various stages in a food chain.

Energy transfer: in ecology, the movement of energy from one life form to another in a food chain.

Environmental action skills: see "Citizenship action skills".

Environmental education: that aspect of education that develops individuals who are environmentally knowledgeable and, above all, skilled and dedicated to working, individually and collectively, toward achieving and or maintaining a dynamic equilibrium between the quality of life and the quality of the environment.

Environmental issue: a problem with obvious environmental overtones surrounding which one can observe differing human beliefs and values.

Environmental literacy: that state in which an individual is environmentally knowledgeable and, above all, skilled and dedicated for working, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment. (Paraphrased from Harvey, 1977)

Environmental sensitivity: a set of affective characteristics which result in an individual viewing the environment from an empathetic perspective.

Epidemiology: the science that deals with spread of and demographics of disease; the investigation of the causes and control of epidemics.

Erosion: the processes by which the materials of the earth's crust are transported from one location to another by forces such as gravity, wind, water, and glacial ice.

Espouse: to take up a cause; to take up as a supporter of a cause.

Facilitator: a person who makes something easy or less difficult.

Feral: untamed: wild; in this document, "feral" usually refers to a domesticated animal that has reverted back to a wild state.

Food chain: a linear pattern describing the flow of energy through an ecosystem; typically beginning with a food producing plant being eaten or partially eaten by a herbivore which is, in turn, consumed by a carnivore, etc.

Food web: a set of interrelated food chains within a given ecosystem.

Formal educators: those educators who typically teach within the constraints of the traditional school; classroom teachers.

Herbivore: an organism that eats plant material, e.g., rabbit, mouse, ground hog, deer.

Hierarchy: an organization of things arranged one above the other according to a logical order, e.g., a hierarchy of goals.

Homeostasis: the tendency to maintain normal internal stability in an organism or an ecological system, such as a hardwood forest, by coordinated responses of the system's components, compensating for environmental changes.

Humidity: a measure of the amount of moisture in the air.

i.e.: symbol for "that is".

Immigration: the movement of a population or a portion of a population into a particular area; usually a permanent move.

Incineration: the burning of something; often refers to a method of disposing of solid wastes in an incinerator.

Infusion: an injection of one thing into another; the process of infusion; as used here, injecting traditional course content with appropriate/logical environmental content, skills, and activities.

Insolation: the amount of light energy that an area receives from the sun.

Interspecific competition: two or more species of organisms competing for the same resource in a particular ecosystem.

Intraspecific competition: two or more individuals of the same species or organism competing for the same resource in a particular ecosystem.

Issue investigation skills: those skills which will permit the learner to successfully research an issue, resulting in appropriate conclusions, inferences, and recommendations.

J-curve: associated with the letter "J" which depicts the growth curve of an eruptive population or organisms, e.g., man.

Learner objectives: those objectives prepared for the student to learn/accomplish; objectives which will be met through instruction, usually stated in performance (behavioral) terms.

Legal action: any legal/judiciary action taken by an individual and/or organization which is aimed at some aspect of environmental law enforcement - or, a legal restraint precedings some environmental behavior perceived as undesirable, e.g., law suits, injunctions.

Limiting factors: in ecology, those variables which tend to put limits on the development of an ecosystem or on the activities of an organism; anything present in insufficient amounts so that an organism's survival and/or reproduction is restricted.

Lithosphere: that part of the earth's crust made up of solid material, as opposed to the "hydrosphere".

Middle level: referring to those grade levels associated with schooling between elementary and secondary, generally grades five through nine.

Middle school: as used in this document, middle school is used synonymously with "middle level school" and "junior high school".

"Midnight dumping" (of wastes): the discarding of wastes by individuals who do so in an illegal and secretive manner.

Monobiotic agriculture: growing only one crop in a relatively large area, e.g., a pine plantation, corn field, soybean field, rubber plantation.
Natality: refers to live births or birth rate.

Natural selection: the survival of a genetic form over time as a result of a particular adaptation favoring that organism.

Niche: an organisms' role in a community; not to be confused with where an organism lives.

Nonformal educator: the educator who provides instruction in settings beyond the traditional confines of a formal classroom, e.g., a teacher in an environmental center.

Omnivore: an organism that eats both plants and animals, e.g., grizzly bear, red fox.

Operations: as used in this document, cognitive or affective mental processes that individuals will use in intellectual activities.

Opinionnaire: a survey instrument designed to assess the opinions of a particular population of human beings on a specific topic.

"Ownership": as used in this document, a feeling of empathy or personal association with a particular issue; to feel an intense interest in a particular environmental issue with an associated desire to investigate and help remediate it.

Parameter: a limit; boundary.

Performance objective: See "learner objective".

Persuasion: an effort, verbally, to motivate human beings to take positive environmental action as a function of modified values, e.g., argumentation, debate, speech making, letter writing.

Pervasive: diffused throughout; to permeate.

Phenomena: events; happenings that may be observed. Singular: phenomenon.

"Player" (in an issue): someone involved in an issue, a person having definite beliefs (and a particular position on the issue) and certain supporting values.

Point sources (of pollution): a specific and definable point which serves as a source of pollution, e.g., smoke stack, sewage treatment plant.

Political action: an effort aimed at persuading an electorate, a legislator (or legislature), or executive governmental agency to conform to the values held by the person or persons taking that action, e.g., lobbying, voting, supporting candidates.

Population dynamics: those interactions which can be observed taking place within a particular species population; population dynamics often refers to those variables which influence the population size of an organism over time in a given ecosystem/biome.

Portray: to make a picture of image of; to depict in words; to describe vividly.

Position: as used in this document, the stance or viewpoint that "parties" or vested-interest groups take on a particular issue.

Prerequisite: required before; necessary as a preliminary to a proposed act.

Primary source of information: a source of information which represents an original source of knowledge, e.g., information from the people actually involved in an environmental issue as opposed to information from an article written about those people.

Proponent: one who makes a proposal; an advocate.

Psychomotor: related to physical skills, as with someone with unusually fine motor skills, coordination.

Quantitative: referring to "quantity" rather than "quality"; a reference to information or data presented in numerical terms.

Questionnaire: a survey instrument designed to gain information held on a particular topic by a certain population of human beings, e.g., college students, the general public, wildlife biologists.

Radioactivity: the property of being radioactive; the radiation given off as a consequence of radioactive decay, e.g., the radioactive decay of plutonium.

Rationale: an explanation; an underlying reason.

Recycle: to use again, in some productive manner, materials which are often considered as solid wastes by segments of a human population, e.g., aluminum, paper products, glass, plastics.

Remediate: to remedy, to restore, cure.

Role playing: to assume the role of a particular individual in an educational simulation activity, e.g., a student "plays the role" of a conservationist in a simulation designed to explore all sides of a particular environmental issue.

Scenario: the outline or synopsis, step-by-step, of a plot or an event; contains all the details of a plot or an event.

Science processes: those critical thinking skills a scientist uses to collect data or solve problems, e.g., hypothesizing, experimenting, inferring.

Scientific literacy: the state of being literate in science; an awareness of and ability to use science, its content, processes, and applications.

Secondary source of information: a source of information at least one time removed from the primary/original source, e.g., reading an article written about an issue as opposed to investigating that issue on a first-hand basis.

Simulation: something that assumes the appearance of reality without being real; the act of simulating; feigning.

Sociocentric thought: the ability to take into account that others may have a different point of view

Solid waste: materials thrown away and in need of disposal, not usually associated with wastes such as radioactive or toxic/chemical materials; often wastes with materials which could be recycled.

Spatial: pertaining to space.

Species population: an interacting group of organisms belonging to the same species; not to be confused with the species as a whole.

Strip mining: the removal of the surface layers of soil and rock so that important mineral deposits can be removed for use by man.

STS: referring to "science-technology-society".

Subsidence: a sinking of the earth's surface due to some underground excavation, e.g., the removal of ground water or shaft mining.

Substrate: a foundation; a term often used in agriculture and ecology to refer to subsoil or the rock layers underlying subsoil.

Subsumes: include under; to take up; specifics are subsumed within the general, or individuals are subsumed within populations.

Succession: the progression of plant communities from one to another in a given locality; often begins with a pioneer community progressing through a series of plant communities toward a climax plant community.

Survey: a mechanism for gathering information about something, e.g., a survey of abandoned vehicles in Jackson County, Illinois, a survey of public opinions concerning the acid rain issue; to take a broad or comprehensive view of something.

Syntax: orderly arrangement; to put in order, a sequence.

Synthesis: a combination of parts as to form a whole; building up something from its elements; combination of thoughts into a whole; the opposite of "analysis".

Topography: the undulations of the earth's surface; the configuration or relief of a surface.

Value (i.e., a value): an established ideal; a way of acting; the perceived worth of something, e.g., the perceived worth of wildlife.

Value position: the value category underlying a particular belief statement or verbalized position on an environmental issue, e.g., a person who wants to preserve a marsh because there is good duck hunting there is reflecting a recreational value position.

Values clarification: the process an individual goes through as he/she inspects the bases for a value perspective, e.g., the process and individual would go through as he/she seriously inspects a personally and particularly strong economic value.